Compressed Air Magazine

APRIL 1957

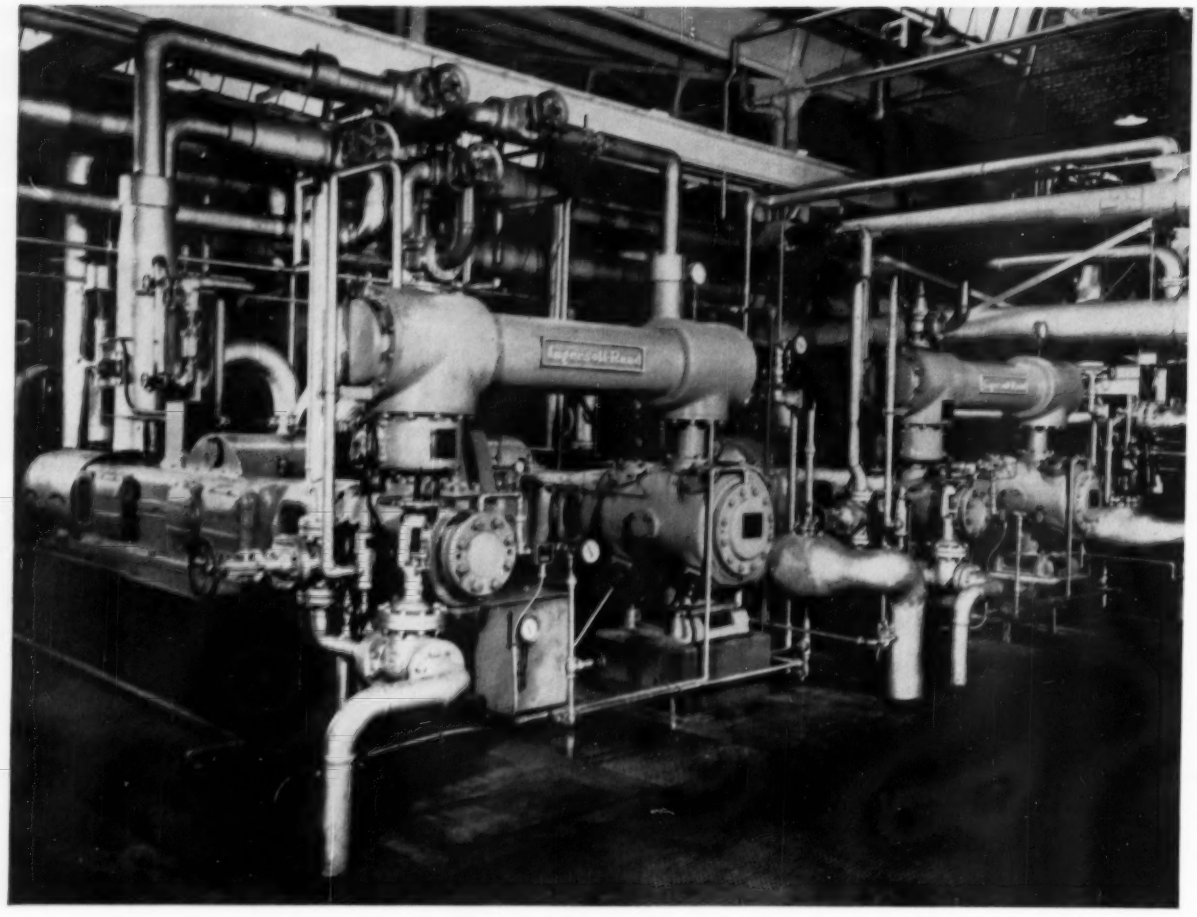
CHERRY TREES IN NATIONAL CAPITAL

Washington monument framed by clusters of blossoms

(SEE INDEX PAGE)

VOLUME 62 • NUMBER 4

NEW YORK • LONDON



key to reliable air power

TEXACO REGAL OILS R&O

Texaco Regal Oils R&O keep air compressors operating at full efficiency year after year. Here's how:

1. **They provide protective lubrication that guards against wear and friction.**
2. **They protect against harmful deposits and rust—keeping lines clear, rings free, system clean.**

Texaco Regal Oils R&O are specially refined oils, enhanced with effective additives. These additives increase resistance to oxidation, prevent rust. You get better operation, spend less for maintenance.

To select the right Texaco Lubricant for your air compressors, call on your Texaco Lubrication Engineer. He can tell you which of the *Texaco Regal Oils R&O* is best for your needs.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

TUNE IN . . . METROPOLITAN OPERA RADIO BROADCASTS EVERY SATURDAY AFTERNOON

Circle 1A on reply card.

KEEP IT CLEAN... by Phil Tration

Here's a sales idea for you barbers. What customer could resist the appeal of a shampoo that's so clean even the rinse water is filtered by a Dollinger Staynew Filter? (What ridiculous application will they think of next).

This is just our way of showing you that the uses for Dollinger Filters are truly unlimited. Any liquid, gas or air can be efficiently and economically handled by them. Whether you want to protect machines or processes from damage caused by dust, dirt, oil, grease, or other foreign matter, there is a Dollinger Staynew Filter which will do the job efficiently and economically.

They are in use throughout the world...the recognized standard of quality wherever filters are used.

STAYNEW MODEL CPH PIPE LINE FILTER has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This "double action" design eliminates need for frequent cleaning.

Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer . . . or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 7 Centre Park, Rochester 3, N. Y.

PROTECTOMOTOR

STAYNEW **DOLLINGER**

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

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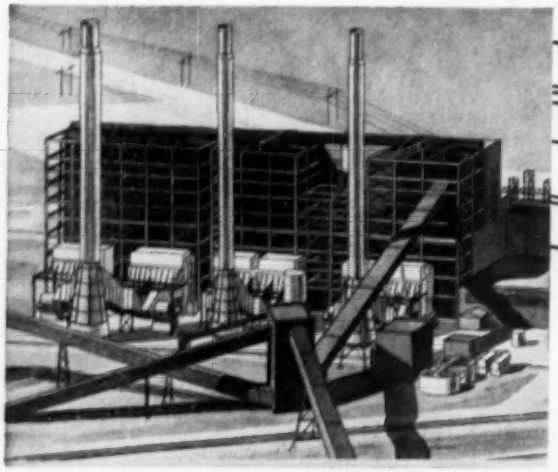
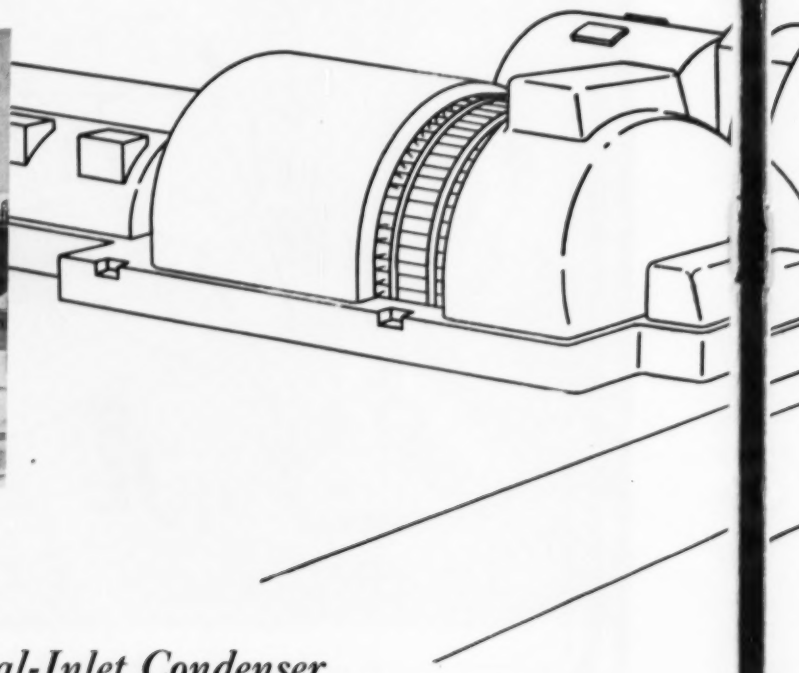
another forward step in

CONDENSER PROGRESS





New 130,000 sq ft Axial-Inlet Condenser for Unit No. 3 at Union Electric's Meramec Station will serve 280,000 kw Axial-Exhaust Turbine

HERE'S another outstanding example of the superior adaptability of Ingersoll-Rand condenser design. As shown by the artist's rendering at the right, the new 130,000 sq ft I-R surface condenser for Union Electric's No. 3 Unit at Meramec Station will connect directly to the discharge end of the 280,000-kw axial-exhaust turbine. A precisely engineered flow passage from turbine to condenser tube bundle assures maximum overall turbine-condenser performance.

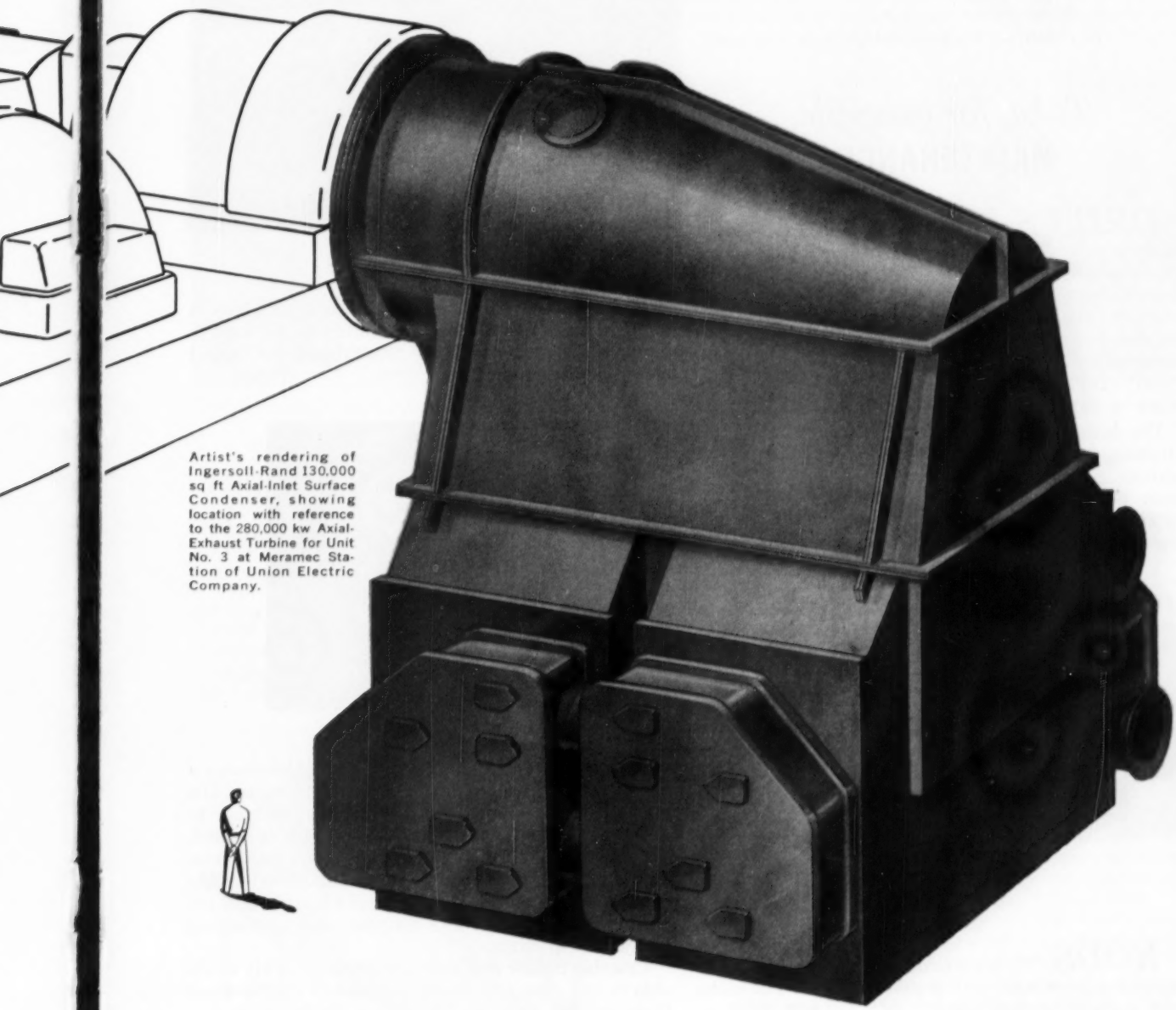
This new type of Axial-Inlet design marks an important advance in condenser technology—the result of close cooperation between I-R engineers and the turbine designers. The condenser unit is of the two-pass, rectangular type with divided water boxes and power-driven reversing valves.

This 130,000 sq ft condenser will be the *third* I-R unit at Meramec Station, Units 1 and 2 being served by two 90,000 sq ft Ingersoll-Rand condensers of conventional under-turbine design.

Whatever your surface condenser requirements, they can be met to excellent advantage with the versatile Ingersoll-Rand rectangular design. Your I-R engineer will be glad to consult with you on the design of equipment best suited to your needs.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS

by Ingersoll-Rand



Artist's rendering of Ingersoll-Rand 130,000 sq ft Axial-Inlet Surface Condenser, showing location with reference to the 280,000 kw Axial-Exhaust Turbine for Unit No. 3 at Meramec Station of Union Electric Company.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

4-462

how to get the most out of HOLLOW DRILL RODS

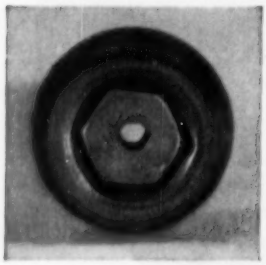
Modern drill rods – especially new *alloy* hollow drill rods like Crucible CA DOUBLE DIAMOND or 4E – give longer drill life than was possible with straight carbon rods. They'll give you lower cost per foot of hole drilled on the job. They will, that is, if you let them. For *abuse* will stop even the best steel from doing its best job. And you pay the price in higher drilling costs.

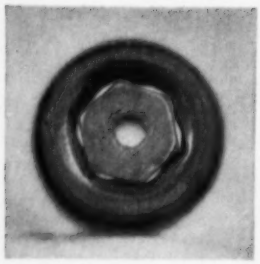
Rods properly racked and stored give better service.

Take, for example, MAINTENANCE:

DRILLS — Pneumatic drills are often so badly in need of repair that good drilling is impossible. Early failure of any rod used in these drills is inevitable. The solution is regular, periodic inspection of all drills and equipment – replacement of worn or damaged parts.

The damaged and worn striking faces of these pistons prevent impact from being transmitted to the rod in a straight line. Rod failure results.





RODS — It's a temptation to store drills by throwing them into one big pile. Resist it. For nicks and surface damage result – drill failures occur at points of damage.

BITS — Keep bits sharp. A dull bit binds in the hole, and drills so slowly that little useful work is performed. But the drill steel must absorb the rugged blows of the hammer.

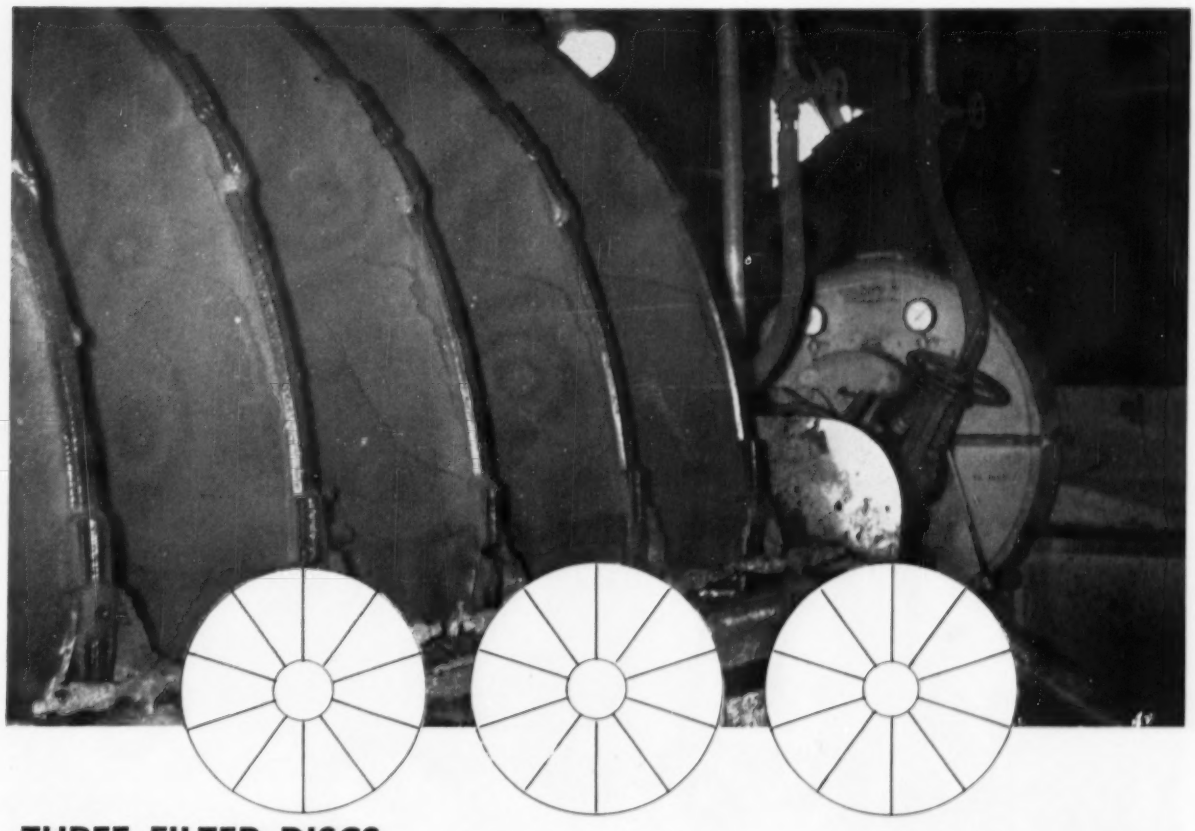
Proper bit maintenance pays off.

It pays big dividends to make good maintenance a habit. Quality drill steels, like Crucible CA DOUBLE DIAMOND or 4E Alloy Hollow Drill Rods, are made to give long service, lowest cost per foot of hole drilled. They're tough, strong, made to tool steel standards. This *extra* quality assures you of minimum rod breakage, fewer valuable bit losses. But to bring out the best in 'em, you've got to do your part by keeping equipment in shape.

Crucible hollow drill rods are always quickly available in the sizes and types you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

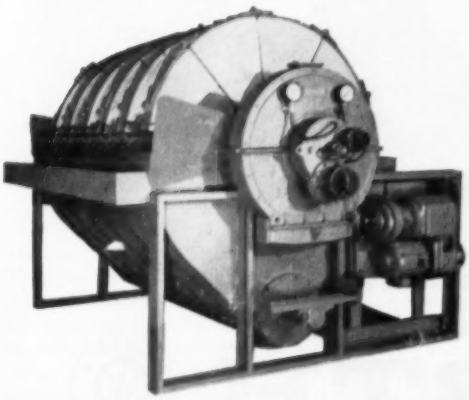


THREE FILTER DISCS

They LOOK the same – TRUE!

Yes . . . to the unobserving eye these three illustrations of widely-used filter discs appear identical. But—in operation—there's a sharp contrast in their filtering capacities.

From left to right—Disc one is 8' 6" in diameter with **94** square feet of filter area . . . Disc two is 8' 10" in diameter with **104** square feet of filter area . . . Disc three is an 8' 10" diameter **EIMCO** disc with **110** square feet of filter area.



They ARE the same – FALSE!

Eimco's close attention to detail and superior engineering in disc design, get you more square feet of filter area per dollar of capital investment than any competitive make.

For example—Flow rate requirements of a processing firm called for 650 square feet of disc filter area. Eimco met production level requirements with a **six** disc filter while others were forced to specify a **seven** disc filter. **Since the price for each disc is essentially the same, Eimco saved this firm the cost of one disc.**

Further profit per unit of investment is being realized by this firm through Eimco's construction and design features that promote high filtration rates . . . minimum cake moisture content . . . low maintenance, filter media and operating costs . . . simplicity of operation and equipment durability.

Why pay more when you can meet production needs with the BEST for LESS? Ask Eimco . . . in one way—or another—it will be a profitable contact for you, too!

THE EIMCO CORPORATION

SALT LAKE CITY, UTAH

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Export Offices: Eimco Building, 51-52 South Street, New York 5, N. Y.
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B-249

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Eleven lines of WALWORTH Saddle Type Wedge Gate Valves

Bronze-Mounted — All-Iron — Ni-Resist

Outside Screw and Yoke — Non-Rising Stem — Quick Opening

Flanged Ends — Screwed Ends

Walworth saddle-type wedge gate valves are manufactured in eleven different combinations of designs and materials, seven of which are illustrated above.

Saddle type wedge gate valves are easy to take apart and are particularly suitable for lines requiring frequent cleaning. Walworth Saddle-Type Wedge Gate Valves are available in a variety of designs including OS & Y; Inside Screw Rising Stem, and Sliding Stem Quick Opening types—in Bronze-Mounted, All-Iron, and Ni-Resist. All types are designed to permit repacking under pressure in either the open or closed position.

FOR COMPLETE INFORMATION, See your local Walworth Distributor or write on business stationery for illustrated circular.

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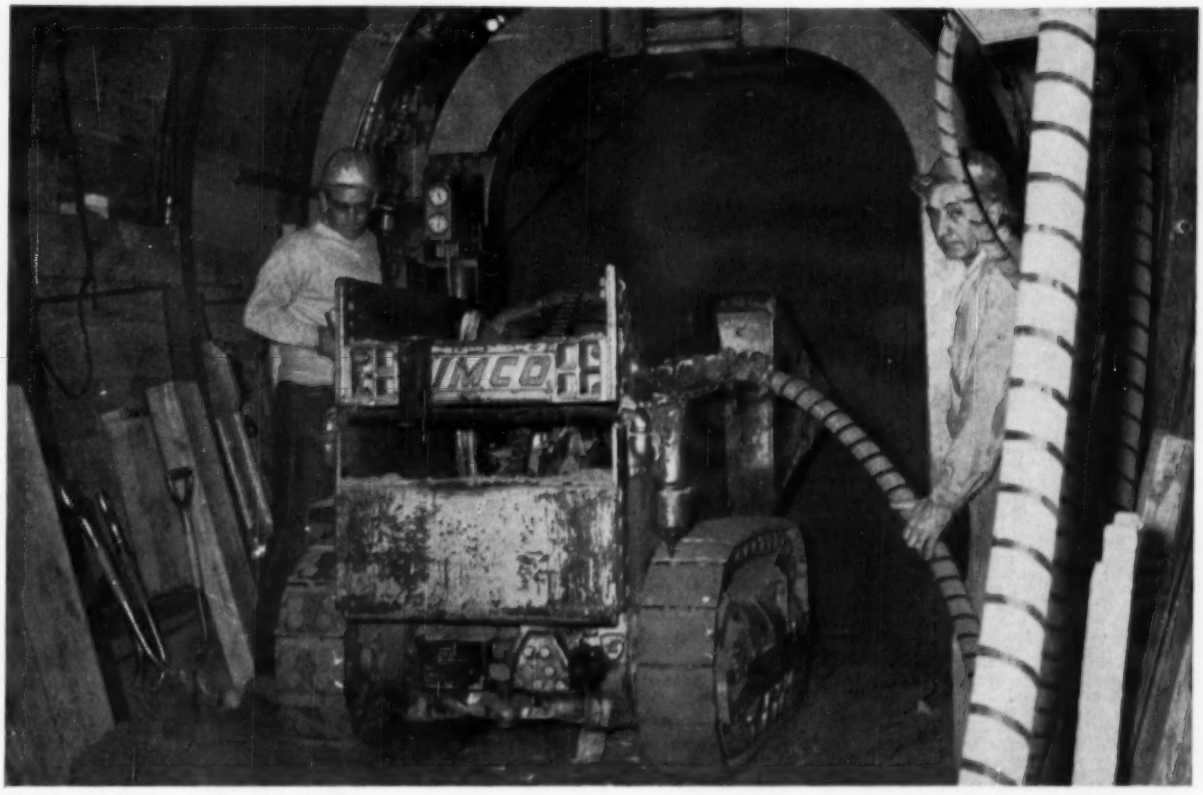


At A Sand Tunneling Project

AN EIMCO 630 DISPLAYS SPEED, POWER, VERSATILITY

Contracting firms at a large West Coast storm drain project employ a unique sand tunneling method that utilizes the loading speed and versatility of an Eimco 630 Crawler-Excavator.

The Elmco mucks at the base of a shield forced into the tunnel face by hydraulic rams bearing against the last set. The shield's broad apron sustains the ceiling and sides of the new cut until supports are installed.

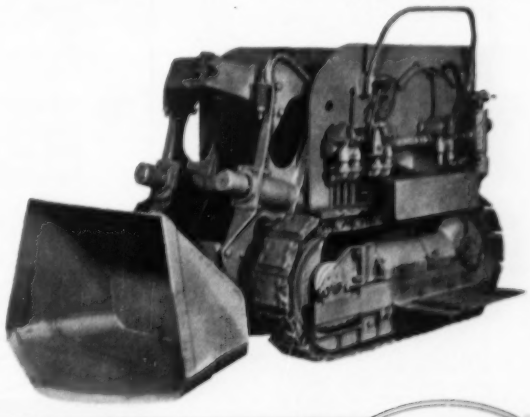
Here are some of the operating advantages being displayed by the Eimco 630:

1) **Loading Power . . .** Though procedure does not require blasting, material at the face is tightly packed. The Eimco's 6,000 pound digging power and independent track maneuverability (it crowds from any angle without making a new approach) are used advantageously to force the half-yard bucket into the face.

2) **Discharge Speed and Versatility . . .** The 630 reverses about 35 feet to discharge into a large hopper on side-mounted rails. To load in the cramped (10' rounded horseshoe) sections, the Eimco relies on overhead rocker arm discharge. While the machine moves from the face to the hopper, the operator gets the loaded bucket into dumping position . . . thus lost motion between excavating and discharge is held to a minimum. The Eimco traverses the 70 foot cycle and still dumps two cubic yards into the hopper every minute . . . enough to load a six (4 cu. yd.) car train every 14 minutes. Daily progress averages 35 feet.

3) **Dependable Service . . .** The Eimco is giving dependable on-the-job service while working in this abrasive sand . . . a real test of the machine's rugged and protective construction features.

The Eimco 630 is constantly meeting new challenges and getting greater tonnages at low operating costs. Watch it in action . . . then you be the judge!



THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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B-247

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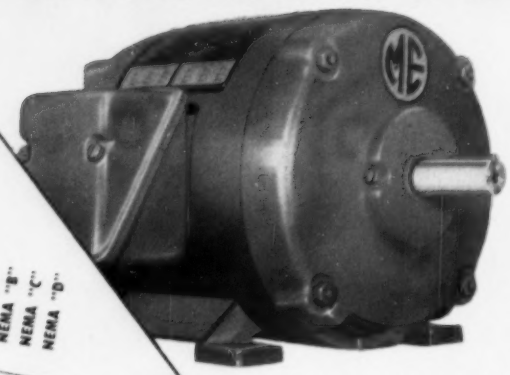

New NEMA Frames 182 thru 326U

MARATHON ME ELECTRIC

Specifications:
40° C Rise Continuous Duty

Designs:
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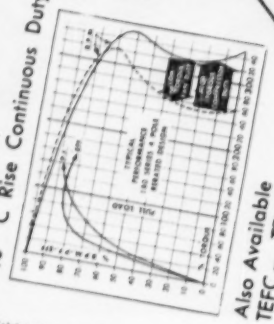
NEMA "C"
NEMA "D"



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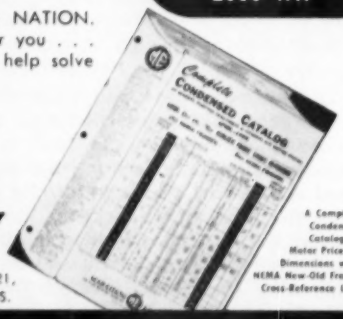
- VERSATILITY . . . WIDE RANGE OF DESIGN. Single Phase . . . Polyphase . . . Direct Current NEMA Standard . . . or Special Design ME can design to meet your special specifications.
- SERVICE . . . THROUGHOUT the NATION. There is an ME District Office near you . . . Call our Sales Engineer TODAY to help solve your motor problem.

MOTORS
1/20 HP thru 2500 HP

GENERATORS
1/2 KW thru 2000 KW

Yours for the *Asking*

WRITE DEPT. 21,
WAUSAU, WIS.



A Complete Condensed Catalog of Motor Prices & Dimensions with NEMA New-Old Frame Cross-Reference List.

SINCE 1913

MARATHON ME ELECTRIC

HOME OFFICE AND FACTORY, WAUSAU, WIS. FACTORIES AT ERIE, PA. AND EARLVILLE, ILL.

SALES OFFICES IN PRINCIPAL CITIES

105 Tractor—Excavator powered by 143 HP GMC Diesel engine can lift and load single pieces up to 12 tons.

THE EIMCO 105 EXCAVATOR LOADS MORE - FASTER . . CHEAPER

Eimco 105 Tractor-Excavators operate on a 10 to 12 second loading cycle. This speed can be maintained under ideal conditions.

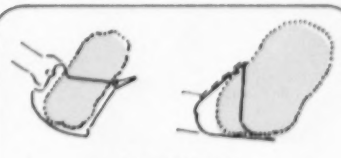
Greater Capacity at 1/3 Initial Cost -

In tough conditions the 105 will out-perform other excavating equipment on a more impressive scale. It will pick up and discharge into the haulage unit much larger pieces of material than will go thru the bottom of a bucket on a boom shovel of equal (1½yd.) capacity.

The 105 will exert greater digging force at the bucket lip than the larger, more expensive boom equipment - often eliminating blasting.

Equipment used around boom shovels such as bulldozers (for pushing up the broken rock) are eliminated with the Eimco 105 because this maneuverable tractor mounted excavator does its own bulldozing.

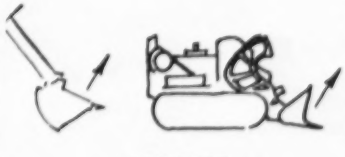
Eimco 105's are rugged, heavy duty machines, built to stay working on the job. Proven overall operating and maintenance costs are 40% less than boom shovels of same bucket capacity. Independent final drives provide greater maneuverability. Up-front position for the operator gives him full visibility. There are many other advantages in the 105. Write for complete information.



COMPARE

BOOM SHOVEL—EIMCO

11/2 yard boom bucket loading is limited to size that will go thru bucket. Eimco 11/2 yard bucket load is limited only to weight machine can lift.



COMPARE

BOOM SHOVEL—EIMCO

Digging effort on 11/2 yard boom shovel (45° boom angle bucket on ground) 24,000#. Digging effort on 11/2 yard Eimco shovel 39,200#.

THE EIMCO CORPORATION

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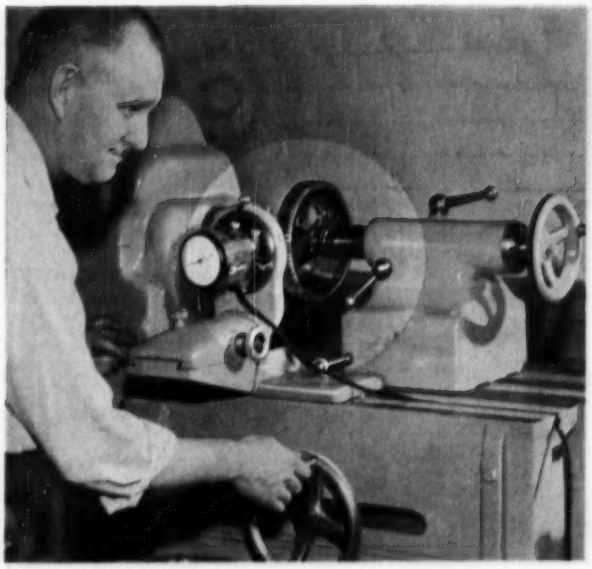
B-245

GM

DETROIT DIESEL PARTS

—factory-engineered for long life, low-cost service

Camshaft inspection—Close adherence to engineering specifications on every General Motors Detroit Diesel replacement part is maintained by routine checks with high precision instruments like this optical inspection gauge with a guaranteed accuracy in millionths of an inch.



Gear dimension control—Gear teeth shaving is measured precisely on the latest-type machines where tape recordings show the contours to an accuracy of one ten-thousandths of an inch.

Magnetic analysis comparator—Here the latest electronic testing equipment is used for a uniform, rapid method in checking metal parts for strength . . . customers' assurance of utmost dependability.

You're always money ahead
when you buy
factory-engineered parts
from your Distributor or Dealer

GM
GENERAL MOTORS
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DETROIT DIESEL

Engine Division of General Motors
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Single Engines . . . 50 to 500 H.P. Multiple Units . . . Up to 895 H.P.

America's First Choice of Diesel Engine

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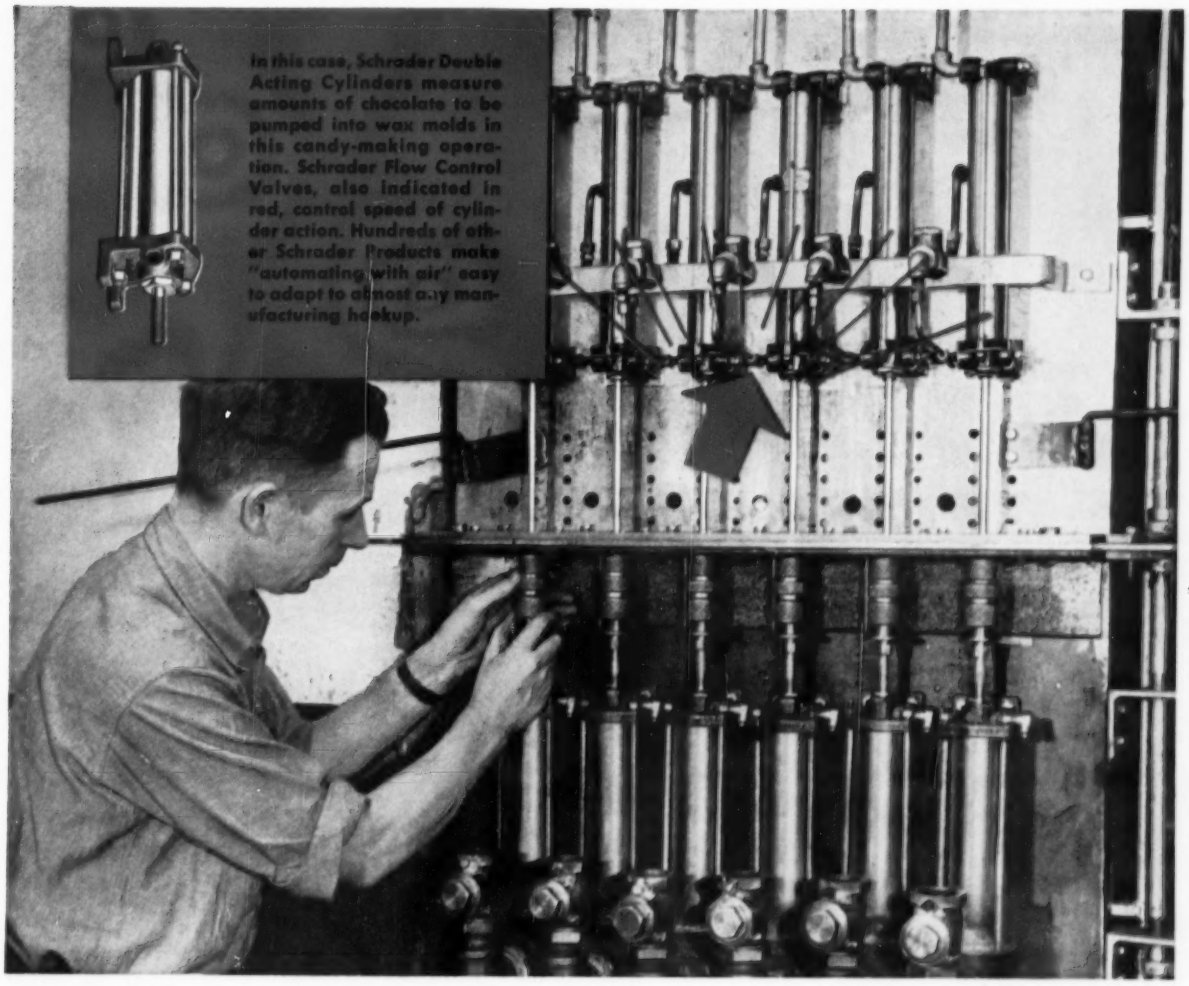
In this case, Schrader Double Acting Cylinders measure amounts of chocolate to be pumped into wax molds in this candy-making operation. Schrader Flow Control Valves, also indicated in red, control speed of cylinder action. Hundreds of other Schrader Products make "automating with air" easy to adapt to almost any manufacturing hookup.

Schrader Air Products fill candy molds with chocolate measured to ± 1 gram

Problem: To mass-produce candy figurines, filled solid with chocolate—a tricky sweet to handle. **Solution:** One Buffalo company uses a battery of Schrader Air Cylinders which measure the chocolate to within one gram, and precisely, neatly, swiftly fill the figures.

The uses of Schrader Air Products are limited only by producers' imaginations. Versatile, safe, simple and fast, the hundreds of different units in Schrader's complete line can be employed singly or in combinations to perform automatic operations. And wherever air is used, economies are gained that increase its efficiency even more.

Think air whenever you think automation—in holding or positioning work, moving scraps or chips, or synchronizing actions. Upon request, Schrader engineers will assist you in planning for your best use of air, and in selecting the products best suited to your applications. Outline your problem and we'll be glad to help. Or send for the latest informative booklets which show Schrader Air Products that will simplify your production.

Schrader®
ESTABLISHED IN 1844

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FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL

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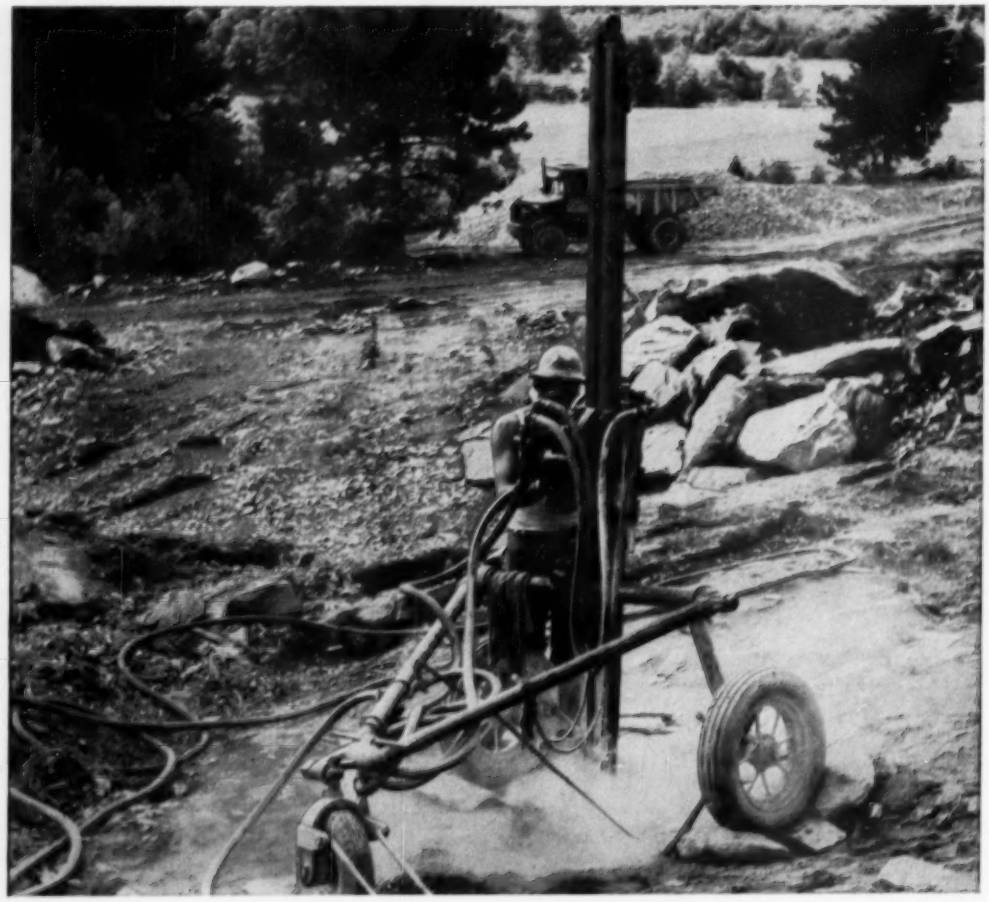

The Wagonjack cuts drilling time in half for scores of jobs. How? Powered forward drill feed, positive feeding pressures, maneuverability, and use of long drill steel. It's a good way to save money. And also to eliminate much of the heavy, tiring work previously performed by manpower.

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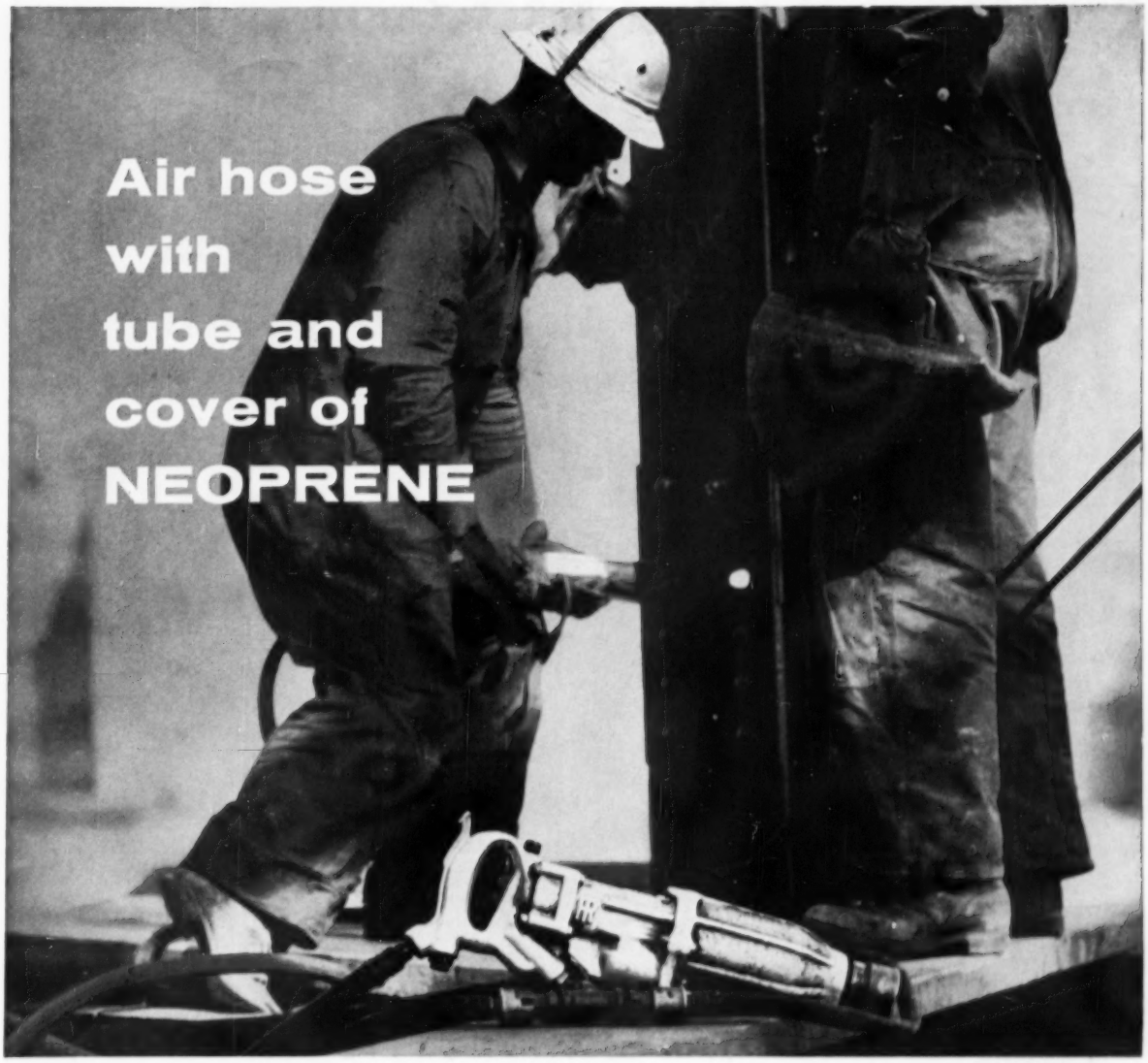

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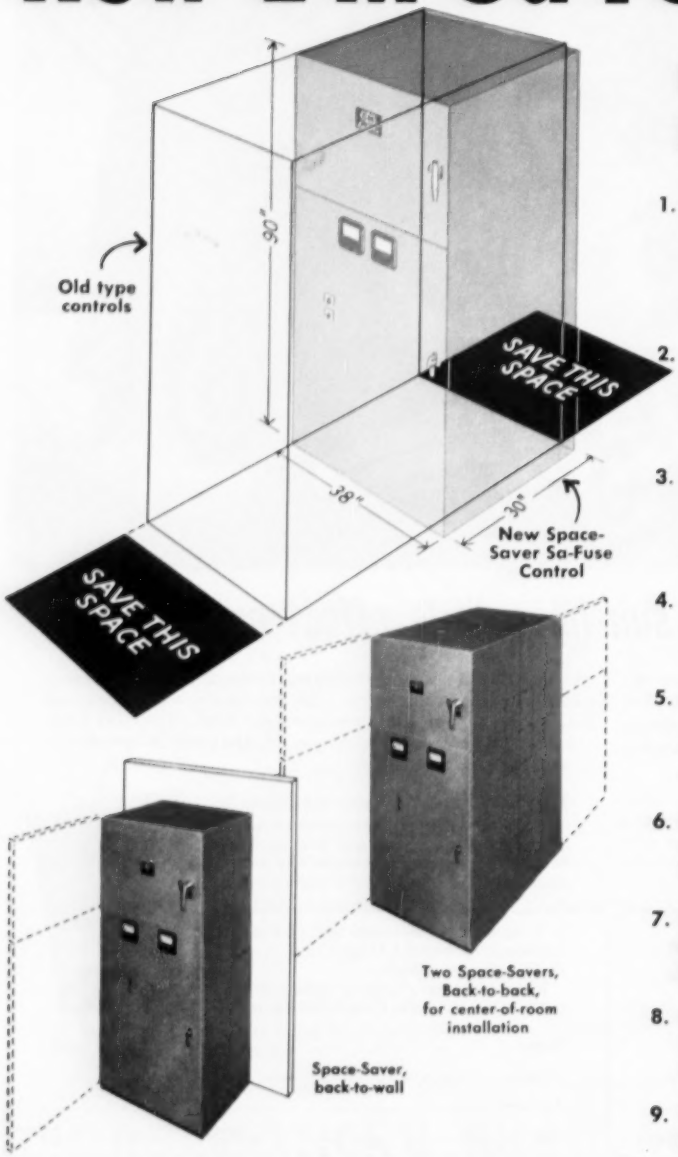

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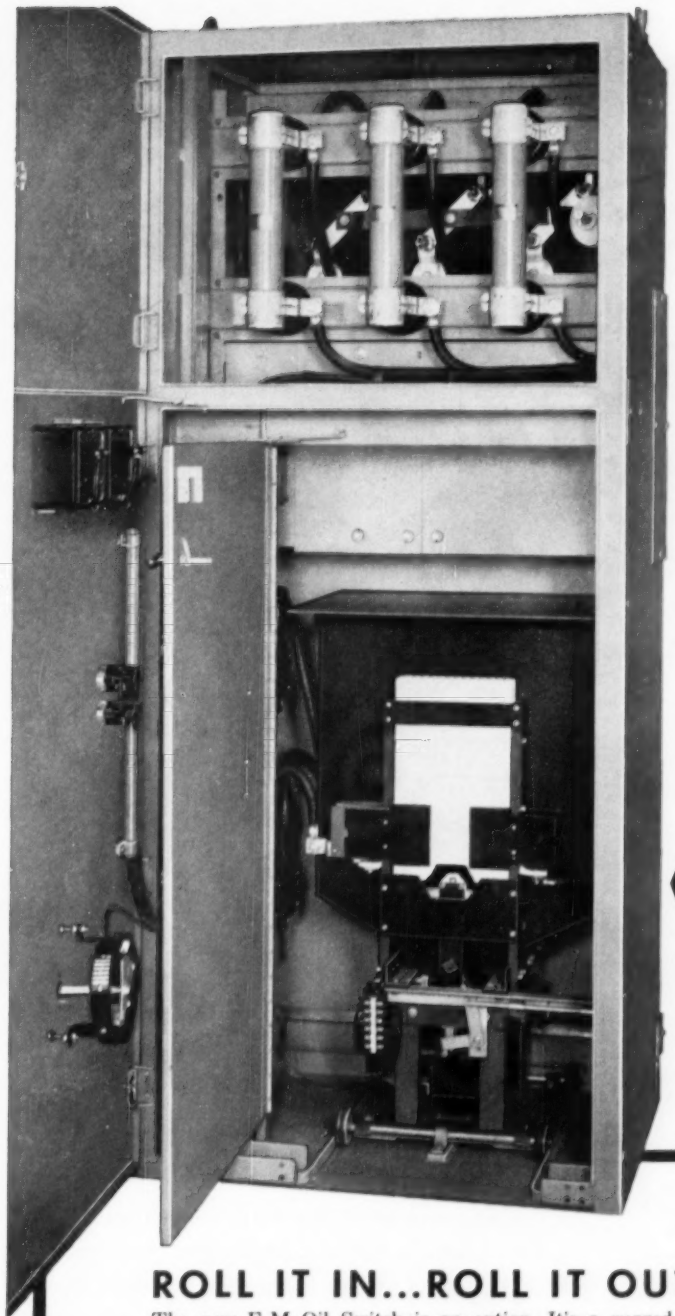

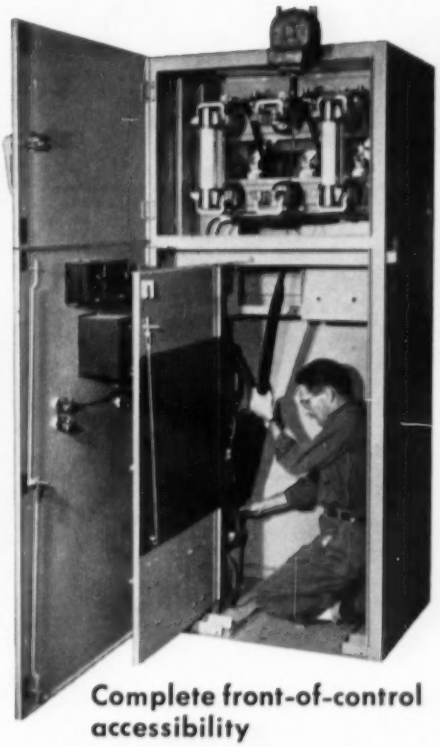

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Cable pulling is easier in the big, roomy high-voltage compartment. Power cables enter through top or bottom of cabinet.

Here's Sa-Fuse with roll-out air-break contactor

Isolated in the high-voltage compartment, the contactor disconnects easily and rolls out for servicing. Note that the disconnect switch blades in the fuse compartment are open and *grounded*.

ROLL IT IN...ROLL IT OUT!

The new E-M Oil Switch is an option. It's a rugged oil switch specially designed for motor starting duty. Control transformer is mounted with it on roll-out assembly.

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WIRE ROPE AT WORK

Now spanning the Delaware is the great Walt Whitman Bridge linking South Philadelphia with Gloucester City, N. J. The $90,000,000 structure, opening in 1957, is a project of the Delaware River Port Authority. It features a main suspension span of 2,000 ft—the eighth-longest yet built. At the midpoint of the span the roadway has a clearance of 150 ft above mean high water.

An interesting phase of the long, tough construction job was captured in the photograph above. As the picture was taken, one of the last of the truss-type floor beams was rising above the water, being lifted into position by strong, sinewy Bethlehem wire ropes. These steel cables handled the truss with ease, though it weighed in the neighborhood of twenty-two tons. The lift was a typical one for Bethlehem ropes, which can always be counted on to bring the load home.

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ON THE COVER

WASHINGTON, D. C., is generally considered to have the most beautiful park and street trees of any American City. There are many varieties, but in April all eyes are on the Japanese cherry trees, then in full bloom. In Japan the cherry tree is reverently regarded because of the beauty of its blossoms. An ancient poet likened it to the soul of the country and it has been regarded thus ever since.

In our cover picture the trees frame the Washington Monument, another favorite with visitors. A tapering shaft of white marble, it is 555 feet high and 55 feet square at the base. Its erection was started by the Washington National Monument Society with funds raised by popular subscription. The cornerstone was laid in 1848, but construction stopped during the same year when the money ran out and was not resumed until 1875 and then at government expense.

IN THIS ISSUE

FURNITURE manufacturing has emerged in the past half century from a craft to a well organized industry. As our leading article explains, air power serves it efficiently in two ways: first to hold the components securely while they are being worked on and assembled; and second, to run many of the tools that shape the pieces, drill holes in them and apply fasteners of suitable types.

•

THOSE of our readers who have visited Ingersoll-Rand Company's head office in New York City have looked across lower Broadway at the venerable Produce Exchange Building. That structure, still sound and serviceable but outmoded, is being razed to make room for a 30-story modern office building. Page 102.

•

THE OUTDOORS is the geologist's laboratory. One of the best places to study the earth's crust is Colorado, which, fortunately, is also a nice place in which to spend the summer. Students from numerous colleges combine work and pleasure there each year. Page 106.

•

THE INTERNATIONAL Geophysical Year, which will actually last 18 months, is designed to bring us greater knowledge of the universe of which our earth is a part. The activities of the nations that will participate in the program are expected to cost $225 million. Page 111.

Compressed Air Magazine

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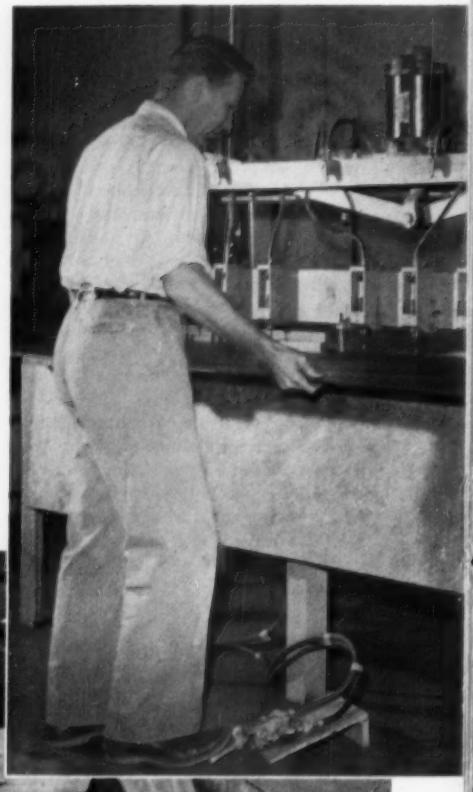
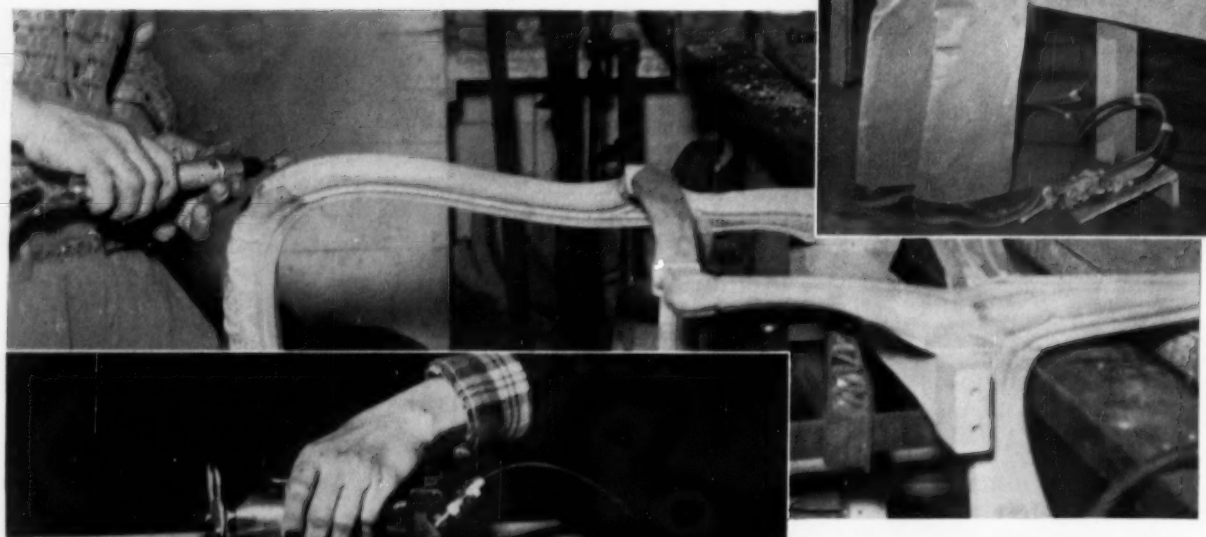
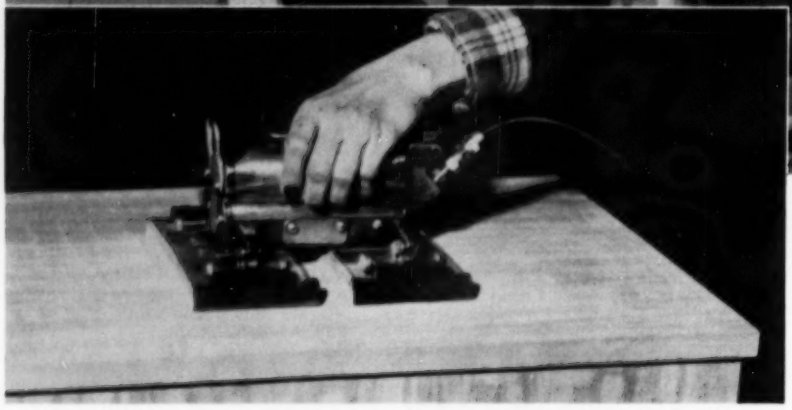
Air Power Helps Make Good Furniture

It's a Handy and Tireless Helper in Modern High-Production Woodworking Shops

J. P. SMALLWOOD







CARVING TOOL

The reproducing of antique furniture calls for a lot of detail work but much of the tedious manual labor has been taken over by air-powered carving tools. A craftsman is shown above routing a fancy design on a chair in the shop of Paramount Furniture Company, Montreal, Canada.

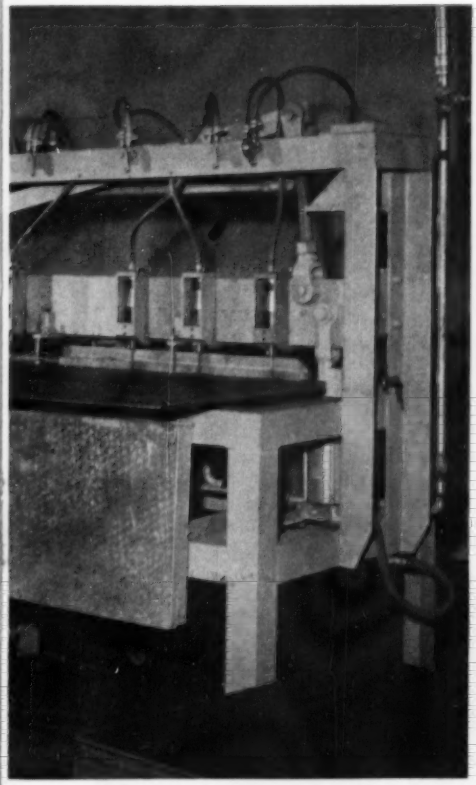
FINISHING OPERATION

The final touches in furniture making, say many manufacturers, are "the ones that sell," and it is true that shoppers rate appearance very high. A pneumatic sander is shown performing what the trade calls "white sanding"—removing press marks and other blemishes resulting from assembly operations. After filler and other finishing coats have been applied and dried, the air sander again goes to work, but uses buffing pads instead of sandpaper. Depending on the buffing materials used, either a dull-satin or a high-gloss finish can be obtained. Water or oil is used as a lubricant.

HAVE you ever examined the easy chair into which you settle your aching bones at the end of a day? Luxurious as it may be, the chair, as well as every other piece of furniture in a modern home, is a tribute to the science of mass production and automation. If it were handmade at existing labor costs the average man probably couldn't afford one. In any up-to-date furniture factory, compressed air and sometimes vacuum play an ever-increasing part in speeding production and keeping manufacturing costs down—in short, allowing retail prices to hold their own in relation to other products.

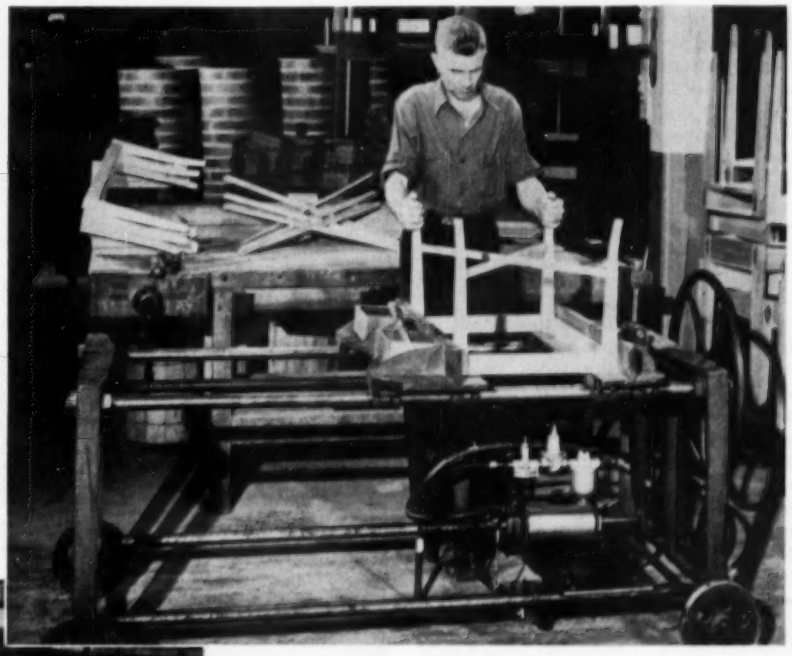
CLAMPING

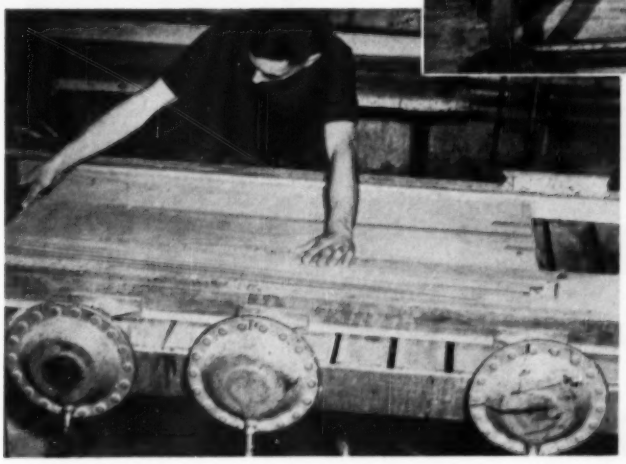
One of the important ways in which air power reduces costs is through pneumatic clamping. Air jigs and clamps can be adapted to hold work of any shape for cutting, machining and gluing. They make it possible to apply predetermined pressures against any point or surface without racking or vibration. Furthermore, they are easier to handle and require less skill than manual clamps. In



MULTIPLE DRILL PRESS

Some applications in the furniture industry present opportunities for grouping tools in special fixtures and operating them in unison, thus duplicating the highly successful practice now gaining favor on automotive assembly lines. The multiple drill press used by a Minnesota manufacturer of display cases (left) simultaneously drills nine holes in Masonite panels. Nine normally hand-held Ingersoll-Rand drills are mounted as shown and arranged for raising and lowering by a linkage powered by the central overhead air cylinder. The press is controlled by a pedal, leaving the operator's hands free to feed and remove the panels.





AIR CLAMPS AND JIGS

Air-powered clamping of assemblies for gluing and machining materially expedites furniture making. The Fitton-Parker Furniture Company, Limited, Southampton, Canada, designed and built a cross-banding clamp (left) that utilizes three diaphragm-type air cylinders to exert pressure on a heavy wooden jaw sliding on a work table. Material to be clamped is backed up by a fixed jaw at the far edge of the bench. The clamping device shown above is powered by an air cylinder made by the Bellows Company. As it is adjustable to handle a wide range of products, it is mounted on wheels so that it can be moved to any department that may need it. It requires only one hose connection and is controlled by a pedal linked to the integral valve assembly in the cylinder. On many of the parts processed with the aid of this clamp, costs have been reduced from 25 to 50 percent. On others no great saving is apparent, yet workmen report a decrease in fatigue.

general, they assure work of high quality because squaring-up is automatic and the operator can do a good job of assembly and inspection in a short time. Clamps must be sturdy and rigid to withstand the grueling pace of high production. They should also allow access to all parts of the assembly.

Modern air-controlled case clamps are extensively used in manufacturing drawers and their frame assemblies and cabinets of all kinds, that is case goods. They are available in stationary or revolving models for either 1- or 2-way clamping.

High-speed pneumatic sash-frame clamps aid in bonding either wood or plastic veneers to edges of table and desk tops, doors, etc. The design of these units makes them readily adaptable for use with flexible strip heaters for thermosetting glues. Wooden forms insulate the heaters from the steel clamping jaws and may be shaped to conform to curved or irregular parts.

An air cylinder mounted in a swinging position actuates a pitman rod running the length of the sash clamp. It is connected to a series of closely spaced cams that force clamping jaws against the work in a true parallel motion. Additional pressure may be obtained at any location merely by placing a shim (a strip of sheet metal) along the face of the jaw at that point. The mechanism is actuated by a foot valve in front of the machine. A number of makers of woodworking machinery offer a full range of 1- and 2-way pneumatic sash clamps, the former applying pressure on one surface or side of a rectangular part and the latter on two.

Large frames for dressing tables, wardrobes and the like can be handled quickly by carcass clamping machines. The length of one of these devices usually is adjusted by a handwheel-operated, horizontal screw stem that moves an end cage laterally. Stops in the sides take care of vertical adjustments. A single cylinder exerts pressure on the machine's movable side to hold work for gluing,

drilling and driving screws. Another type often used to assemble beds has pneumatic clamps that can be positioned on a slotted table to accommodate work of different sizes. A typical unit has three cylinders on one side and one at each end.

PNEUMATIC TOOLS

Augmenting the clamp-type assembly machines are labor- and dollar-saving pneumatic tools. They are available in straight- or angle-head models and with a variety of attachments, such as magnetic bit holders, screw finders and quick-change chucks, so that they can serve several functions. However, production methods usually require that each tool be used for its specific job and do not permit time-consuming, station-to-station transfers. Moreover, refinements in tools built for specific duties reduce work spoilage and increase production. Cushion Clutch tools made by Ingersoll-Rand Company, for example, have an engaging mechanism that prevents rotation until its screw-driver head is accurately positioned and pressure is applied. The clutch is adjustable to maximum torque values: it will not tighten the fastener beyond a predetermined limit. This feature is especially useful because the operator can make adjustments for best results with woods of different hardness, grain and moisture content.

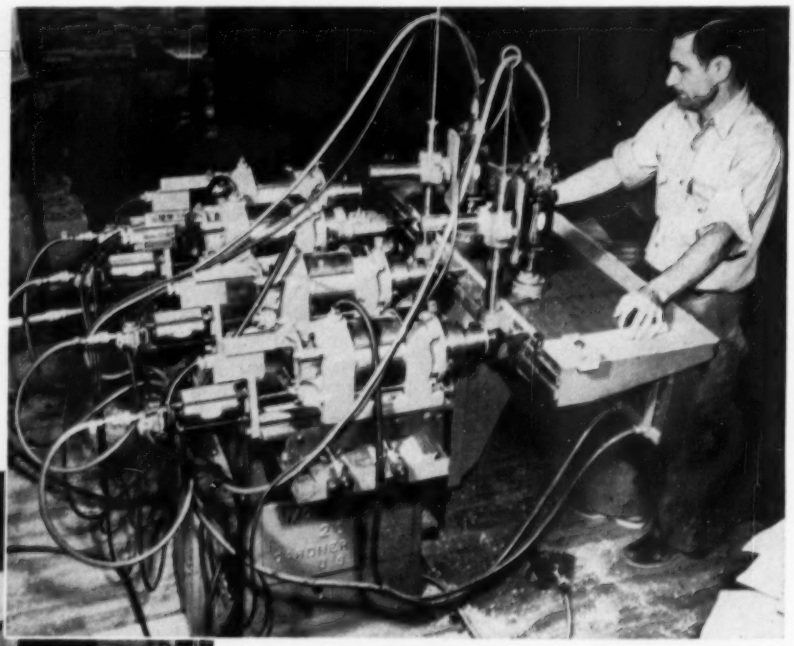
Air-powered staplers or tackers save time and effort. The newest models have adjustable guides that not only make it easy to accurately position staples but also produce results that are neater than those obtained by hand methods. Effortless triggering by touching the head of the tool to the work is a feature of these units. Finishing requires no additional countersinking. One television manufacturer reports that "air tacking fastens grill cloth on TV cabinets more than twice as fast as hand tacking."

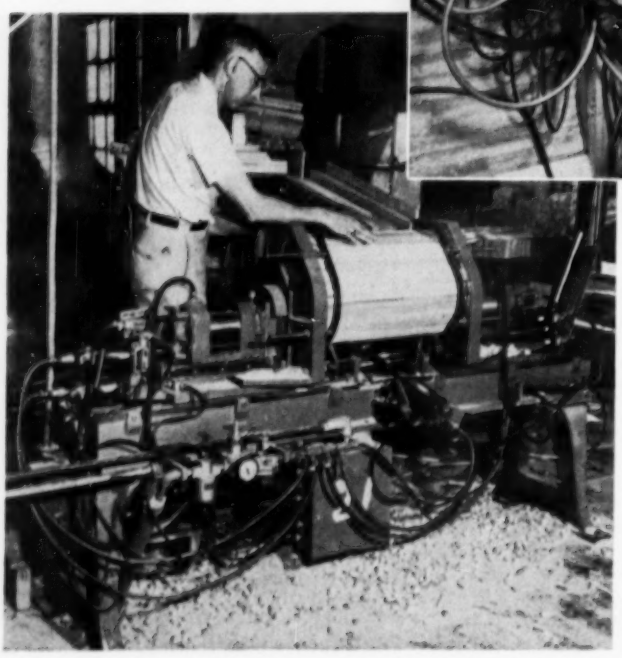
In many factories lightweight air-powered riveting hammers with nail-driver sets enable assemblers to drive fasteners at three times the rate with hand hammers and with less effort. Nail sets can be supplied to fit a wide variety of standard nails; or soft blanks are available that can be cupped to any desired shape by machining, and then hardening. Most of the better lightweight riveters have built-in power-regulators that make them adaptable to many nail-driving tasks.

In recent years, air and electric impact wrenches have made their appearance in woodworking plants. Having adjustable torque-control features, these tools serve to advantage wherever nuts and bolts are needed, where screws of unusual length must be driven or where extra-tough wood is involved.

Automatic carving machines, though adaptable, often cannot achieve the degree of detail required in making, for example, period reproductions. Pneumatic carving tools, on the other hand, enable artisans quickly to work quality into a copy, thus greatly increasing its market value.

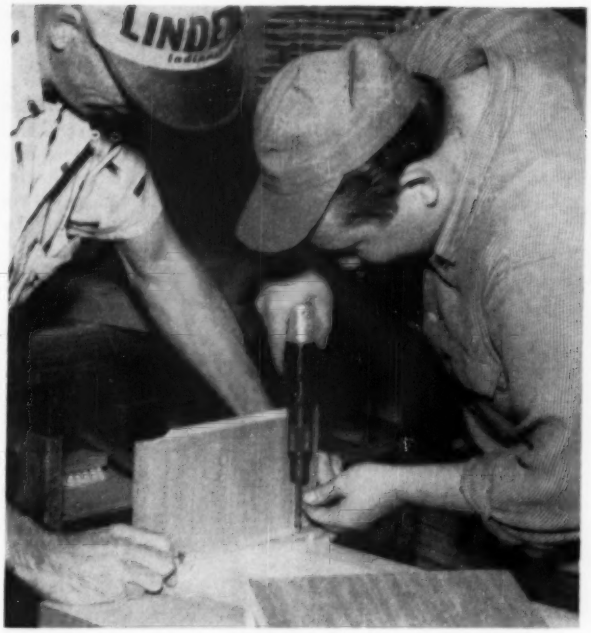
Without air sanders and polishers the finishing department would be a troublesome bottleneck. At this point, except in the case of unpainted furniture, the product is "so near and yet so far" from the market. A TV cabinet, for instance, could no more go near a dealer's showroom without its finishing touches than would a young girl meet her boy friend without the careful application of face powder, nail lacquer and lipstick.





MULTI-PURPOSE WOODWORKING MACHINES

Time and labor are saved by doing several jobs with one loading of a part into a machine. An automatic double-end sawing and chucking machine (left) at Gardner Wood Products, Gardner, Mass., produces spindles or slats for babies' playpens. Rough-cut spindles are loaded into a hopper at the center of the machine and from there each is fed in turn by a Bellows air cylinder to a positioning stop. Then other cylinders advance combination circular saw and chucking blades, cutting the piece to size and turning both ends in one operation. When the tool sets are retracted, the stop is pulled from behind the spindle and the finished piece drops into a bin at the rear. The device is manufactured by McKnight Machinery Company, also of Gardner. Another McKnight product (above) simultaneously drills four dowell holes in a table top. With the top in position, a control pedal is depressed to start an automatic sequence of operations: first two vertical air cylinders clamp the piece firmly, strips of emery paper being affixed to the faces of the pads to increase their holding power; then horizontal cylinders feed the drills into the work. After the holes reach proper depth, the drills are retracted and the piece released.



CLOSE-QUARTER WORK

A Philadelphia firm formerly assembled bedroom cabinets with electric screw drivers and a screw press, but the side-to-center distance of the tools was too great to permit getting at some of the screws and these had to be driven by hand. The difficulty was overcome by changing to Ingersoll-Rand air-powered screw drivers, a straight-type model (left) and an angle model (right). Production rose from 25 to 65 units a day and workmanship improved. Savings were computed as $1.35 per cabinet or $87.75 daily and the cost of the tools was recovered in 3½ days.

Although finishing operations vary, the general procedure is: rough sanding, filling, sealing, sealer-sanding, staining, lacquering and burnishing. A variety of oscillating and rotary pneumatic equipment is available for use on all types of surface contours and in every operation from white sanding to final rubbing.

HOISTS

Whether handling bulk lumber in the receiving department, shifting sofas during final stages of assembly, or lifting completed chairs in the shipping department, air-motor hoists can do the job safely and quickly and save man power. The most efficient models incorporate radial-type motors and are provided with automatic up- and down-stops to prevent accidents and work spoilage. Their variable speed control permits fast, safe handling of loads, and overloads cannot harm them as the hoist motor simply stalls when overloaded. If the air supply should fail, automatic brakes will prevent dropping the load. Air motors are valuable as tuggers for skidding and pulling and as drivers for conveyor systems. Their use in place of electric models minimizes fire hazards and reduces insurance costs.

MACHINING

In machining furniture parts air power speeds work and effects marked production economies. Shapers, equipped with pneumatic cylinders to hold the work, automatically perform all cutting operations. Special lathes for turning knobs, legs and the like can be provided with air-powered tailstocks that insure a more positive grip than spring clamps, eliminate vibration and permit fast cutting.

A front and back post-borer can bore both horizontal and vertical holes at the same time and complete the multiple operations as fast as a worker can feed stock. Pneumatic clamping cylinders are synchronized with the movement of the cutting head.

Bell Machine Company of Oshkosh, Wis., has developed a unit with automatic air hold-down clamps and table blow-off devices that performs multiple chisel- or chain-mortising operations or multiple boring jobs either simultaneously or separately. A pneumatic feed table is an important factor in its high speed. In fact, the cushioning effect of the air permits cutting tools to pass quickly through the work taking occasional hard spots in stride and limited only by their capacity to remove material. Unlike mechanical or hydraulic feeds, the table compensates for natural variations in material density.

Another Bell product is a double-ended sawing, boring and chucking machine that can both saw wood into any desired shape and bore dowel holes. The ingenious use of air power is largely responsible for its success. Because pneumatic cylinders move the saws and bits, many complicated unwieldy mechanical linkages are eliminated. Work is placed on a table and air-operated hold-downs lower and clamp the material. Then saws are lowered pneumatically and trim the stock. As they begin to rise, air-control valves are tripped and other cylinders move spindle carriages into the workpiece. As soon as holes are bored, the carriages are retracted and the hold-downs released. The machine can be easily set to stop after each cycle or to continue automatically.

Rye Machinery of England, represented in Canada by Burnett Woodworking Machinery, Ltd., Toronto, Ont., manufactures a high-speed double-sided slot mortiser that has air clamps to hold work on canting tables as well as a pneumatically actuated hydraulic feed mechanism. A Rye double-ended boring machine uses air-powered, hydraulically controlled feed units and air clamps synchronized with the in-feed.

Automatic dowel borers and single-end tenoners are machines with high-production potentials, thanks to air clamps that hold work firmly during tooling and then release it quickly to make way for the next piece. For fashioning curved dressing-table and desk tops having molded edges, chair seats and contoured mirror backs, a single-spindle shaper is often used. It is equipped with a jig on which the workpiece is placed and has a metal template that is held in firm contact with a guide collar by air-power, thus speeding operations and pre-

venting breakout spoilage generally caused by uneven feed pressure.

One machine, designed to bore up to 40 holes at a time, has straight-case pneumatic drills clamped to a series of transverse beams and arranged for quick removal, vertical adjustment and movement the length of the beams. The latter are mounted in a box-section frame which is fixed firmly by T-bolts running in T-slots secured to the side-members. In this way vertical and transverse adjustments for individual drills and longitudinal adjustment for each set of drills can easily be made. This permits a wide range of tooling combinations. The complete unit—frame, transverse beams, and drills—is mounted on four air-hydraulic cylinders that control power for feed and return strokes.

Throughout the industry several types of presses are used for gluing and laminating. Some are 1-way machines, with pressure applied through the work to a buffer plate. Others are 2-way units for clamping cabinet end-panels—as many as 24 in sizes up to 24½x32 inches can be handled—and similar components. Rotary machines are used for laminating when adhesives require only momentary

FASTER AND BETTER

Basic-Witz Furniture Industries, Inc., uses Ingersoll-Rand air tools for various operations in its factories at Waynesboro and Staunton, Va. A lightweight riveting hammer (right) drives dowels into dining room table leaves faster than it was done previously with a hand-wielded hammer and does not damage the dowels. An air drill powering a Tital stud driver (below) drives leg bolts quickly and smoothly whereas the motors of electric tools previously in service burned out. Screw drivers used to assemble table tops (bottom) are suspended from I-R tool balancers, thus reducing hose wear and expediting the work.

AIR TOOLS

Drilling holes and driving screws are two of the commonest jobs in furniture making. At the Victoriaville Furniture Factory in Canada, an Ingersoll-Rand Model 4U drill (left) makes quick work of predrilling screw holes in a mirror frame. An I-R screw driver then puts in the screws (below).

pressure as in the case of joining plastic and plywood. These units generally consist of a set of equal-diameter power-driven rollers through which stock is passed under pneumatic pressure.

Hose presses are relatively new. Compressed air is introduced into a series of closely spaced, oversized hoses located above a movable upper platen. The lower platen of the unit is fixed and consists of I-beams, carefully leveled and closely spaced, over which a steel plate is welded. Inflation and deflation of the hose (approximately 4 inches) operates this press and steel strain rods between its bed and superstructure absorb the total load: no pressure is transmitted to the floor. As the maximum stroke is approached, there is a decline in pressure.

For coating flat or curved surfaces or for spreading adhesive on various types of hard-laminate table tops, the excellence of resilient-roll glue spreaders has been proved. Rollers range from 8 to 122 inches in width and can coat up to 4½-inch-thick stock. These spreaders are becoming increasingly popular for applying fillers and waxes of viscosities ranging from waterlike lacquers to heavy clay pastes. Most roller coaters are air controlled and have pneumatic cylinders for pressure application and positioning.

VENEER AND PLYWOOD

Some furniture manufacturers make their own plywood and veneer using rotary lathes that have two pneumatic cylinders: one to apply pressure to a cutter and the other to rock the cutter back out of the way while a log is being centered.

Air-actuated clamps play important roles in electronic edge-gluing processes for the production of flats or in the preparation of cores for plywood. One such unit has fifteen air cylinders: one to feed stock, six to provide pressure during gluing cycles and eight along one side to exert horizontal pressure.

One machine for bending plywood is basically a mold that is raised and lowered by an air-motor hoist and covered by a hood with a sealing ring around the bottom to make the molding chamber airtight. Air at a pressure of about 140 psi inflates a rubber diaphragm that presses the plywood sheet against the die. Air is simultaneously exhausted by a vacuum pump from a small area underneath the laminate so that it will more easily conform to the contours of the mold.

Another device for bending plywood consists of a pneumatically actuated moving male die and a fixed female die. Parts to be processed are machined to produce a number of equally spaced slots on one surface—the one that will be concave—and at right angles to the bend. Thermosetting glue is spread over this area and a single-ply sheet applied and the assembly put into the press where the glue is set by heat. For convenience when working on large parts, pressure is applied horizontally instead of vertically.

A machine for angle-shaping plywood consists of a main bending arm connected to pistons in a bank of vertical air cylinders. The arm is pushed against a forming roller held in position by screw clamps while another group of cylinders keeps the plywood in contact with it by exerting pressure against a wooden clasp.

In the chair department of a modern furniture factory work is delivered by a conveyor belt to four stations for sub- and final assembly. With some variations the following steps are typical of techniques throughout the industry.

At Station 1, top and bottom backrails are fastened to three vertical slats. After glue is applied, the components are arranged in a single-cylinder air clamp. Then a pneumatic press does a speedy job of gluing the back chair legs to the slats and back rails. At Station 2, an air clamp facilitates gluing the front rail to the front legs. Next the stretcher (the brace that steadies the legs) is glued at Station 3 and the side rails are added. The three components are now ready for assembly at Station 4.

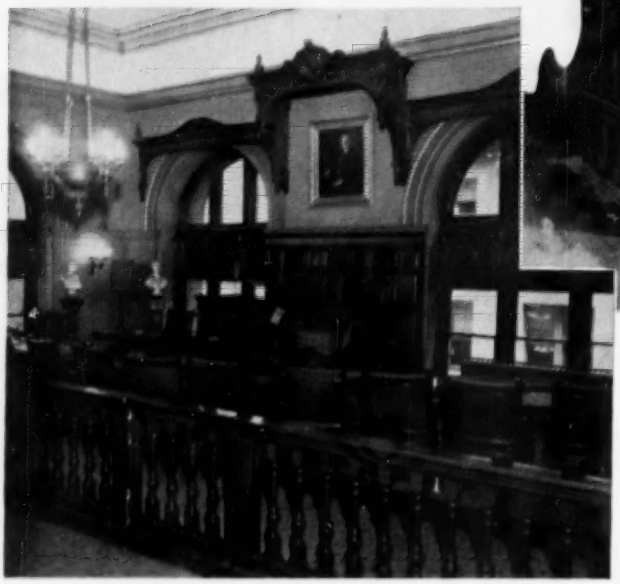
At that point, eight joints—fastening the side rails and stretcher to the front and back legs—are made at one time. The large 2-sectional frame which is used for this work has a pneumatically actuated head that is at the same height as the front rail. The back of the frame, which has two adjustments to accommodate chairs of varying shapes, is stationary during the pressing process. This insures the application of uniform pressure on all the joints. A triangular block is placed in each corner of the seat to prevent distortion.

Air cylinders are also useful for stuffing upholstery into chair seats. The empty frame is confined in a metal mold and a 5-inch-stroke cylinder with a flat plate attached to the piston pushes the material into the seat. A rubber platen allows for expansion so that the seat is completely filled.

Gotham Landmark Coming Down

Historic Produce Exchange Building on Lower Broadway Will Be Replaced by 30-Story Office Structure

C. H. VIVIAN



BOARD ROOM

Here the 12-member board of managers of the Exchange met for 73 years. Wood paneling, statuary, chandeliers and other appointments remained little changed through the years. J. H. Kerrick was president of the Exchange when the building was erected and Franklin Edson was chairman of the building committee.

"GRAND OLD LADY OF BOWLING GREEN"

This fireproof, iron-skeletoned, granite-red brick-and-terra cotta Produce Exchange Building was an architectural showpiece when it was completed in 1884. Fronting on Broadway, it runs from Beaver Street, on the left, to Stone. A bit of Bowling Green Park is in the foreground and a corner of the U. S. Custom House is at the right. The tower clock, a convenience for thousands of office workers in neighboring buildings, has a dial 12 feet in diameter and 6-foot hands. Including the land it rests on, the building cost $4,313,000.

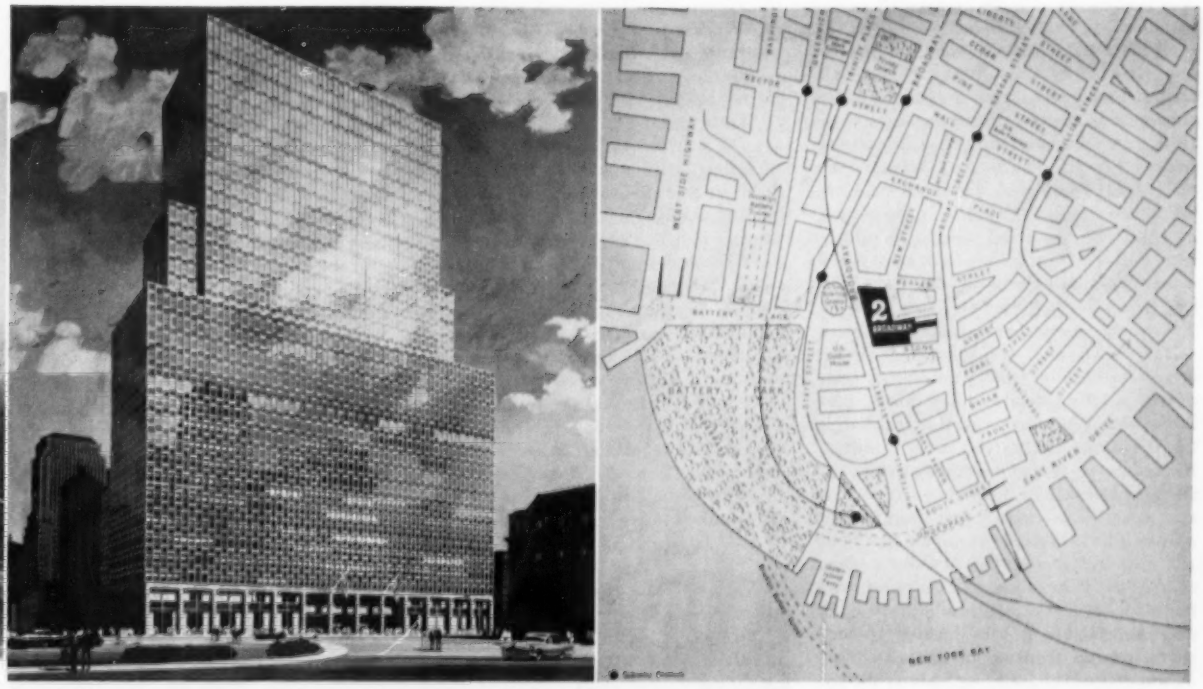
THE PRODUCE Exchange Building, a landmark of lower Manhattan Island in New York City, has fallen victim to the march of progress. Wreckers are demolishing the solidly built "Grand Old Lady of Bowling Green" and builders are standing by with plans in hand waiting to erect a 30-story air-conditioned office structure on the 73,000-square-foot plot of ground.

The building that is coming down, although still sound and tenantable despite its 73 years, belongs to another era of construction. It was built at a time when two technological improvements—structural metal framework and elevators—had recently made high buildings feasible and practical. Although the Produce Exchange Building is only nine stories high, it is a large building (weight 61,000 tons) that was made easier to build and more serviceable by reason of these two developments. With substantially all the weight carried on an iron framework, relatively light walls were made possible instead of the heavier ones previously required. At the time, however, New York's building code specified that these curtain walls should be at least 12 inches thick, so the structure might well have stood until now even without its iron skeleton.

The main portion of the structure was started on May 1, 1881, and finished on May 1, 1884—an elapse of exactly 3 years. It has ground dimensions of 300x150 feet and rises 116 feet from the sidewalk, with a tower section extending 109 feet higher. Nine years later, again on May 1, a 204x56-foot Annex was begun. It went up in just 1 year, the completion date once more falling on May 1. The main building cost $3,185,000 and the Annex $458,000.

The girth of the red Renaissance-style building is such that a tape measure one-third of a mile long would be required to reach around it. Its framework comprises 3 miles of columns and 20 miles of girders. Other materials include 15½ million bricks, 2350 tons of terra cotta trim and an unrecorded but large quantity of granite in the lower walls. Its 8½-acre floor space contains a mile of paneled wainscoting and there are 1300 doors and 3500 windows, the latter equipped with 8½ miles of sash chains and 70 tons of sash weights. Forty miles of steam pipes distributed heat and 1000 horsepower was utilized for heat and power with 9000 incandescent bulbs initially installed. Forty-five hundred drawings were made to guide the various building craftsmen during the construction period.

Two features of special interest are the



NEW BUILDING AND MAP OF THE AREA

To be known as 2 Broadway, the $30-million, 30-story structure (left) is scheduled for completion by the beginning of 1959. Uris Brothers are the builders and owners and Emory Roth & Sons are the architects. The black area on the map indicates the irregularly shaped plot owned by the Produce Exchange. The new building will occupy the left portion of it. What is now New York City began as New Amsterdam here at the tip of Manhattan Island.

foundation underpinning and the elevators. Although the subsurface of Manhattan Island is essentially rock, there is a mantle of soil or silt at its southern tip and some means must be employed to transfer the load of heavy buildings to the firm footing underneath. It was done in this case by driving a veritable forest of wooden piles obtained by cutting pine and spruce trees in New England. There are 15,037 of these under the main structure and it required from July 17 to December 24, 1881, to drive all of them. Fourteen hundred more were driven when the Annex was built.

The eleven Otis elevators are of the rope-geared hydraulic type that was to be superseded by electrically powered models before the turn of the century. However, because these units never developed operating troubles and modernizing them would have been very costly, they were never changed. Although their speed was less than that of later types, their over-all carrying capacity suffered little by comparison because the oversize cars held 30 persons each. The lifts were used by an average of 22,000 persons daily or 6½ million annually.

The records of Otis Elevator Company reveal that a contract awarded its predecessor, Otis Brothers & Company, on February 27, 1883, for nine of these lifts was the largest in elevator history up to that time. The concern had then been in business 30-odd years, having been organized to manufacture "safety hoisters" originated by its founder, Elisha Graves Otis. Two more elevators were put in when the Annex was added. The tower elevator had a rise of 225 feet; the others were shorter. Otis records disclose only one alteration of importance in the installation in more than 7 decades. This was a change from steam to electric drive for the pumps that furnished the water to the hydraulic system.

The building has a distinguishing address—No. 2 Broadway. The northern part of its Broadway side looks out on Bowling Green, a postage-stamp-size bit of lawn, flower garden and statuary of great historic interest—still enclosed by the iron picket fence that was placed there a couple of centuries ago. Under early Dutch rule this plot of ground was in front of Fort Amsterdam, which was removed in 1790. A market was held there daily and a fair occasionally. In 1753, the area was leased to some of the inhabitants for use as a bowling green and it then acquired its present name. Across Broadway from the southern part of the Exchange building is the U.S. Custom House, an ornately decorated structure designed by Stanford White.

On a portion of the site, the first school in New York was opened in 1635 by the Dutch schoolmaster Adam Roelantsen. As was then the custom, the pupils were taught in his home. In the same block was the site of the original Huguenot Church of New York. Bronze plaques marking the approximate locations of those structures are affixed to walls of the old building and will be preserved for placing in the new one.

The Produce Exchange traces its lineage back to the times of Dutch Governor "Peg-Leg" Peter Stuyvesant, when basic commodities such as grains, fats and oils were traded in at an outdoor market place at the tip of the island. In 1658, it was shifted to a lane that led to a canal that ran roughly along what is now Broad Street, one block east of Broadway and the home of many financial institutions and shipping firms. For reasons not now apparent, the mart was called the Broadway Shambles Market. By 1754, the name had been changed to the Royal Exchange, and the location to Broad and Water streets. This establishment was succeeded by the Merchants Exchange, on Wall Street. In 1840, the traders, still outdoors, were holding forth at Broad and South streets, close to the piers from which ships left with American produce and to which they returned with things we needed, such as spices, fats and oils.

Soon afterward trading was moved indoors under the name of the Corn Exchange and the first home was a warehouse. This was a dark, dirty and repelling place and, to add to the troubles of the rank and file of the membership, four or five of their number managed to

corner most of the business and threatened to "freeze out" the others. Whereupon the "outs" set up the New York Commercial Association under a charter obtained from the state legislature in 1861 and prospered to the point where they were soon able to move into a specially built trading floor and office building at 39 Whitehall Street, now owned by the U. S. Army and used as an induction center. The group that had previously been in command was forced to ask to come back into the fold.

Twenty years later larger quarters were needed and plans were made to erect the building that is now being torn down. At the same time, the state legislature was petitioned to authorize changing the name to the New York Produce Exchange as being more descriptive of the activities. The president's report in the year 1881 told something of the plans. The building committee had held 120 meetings during the preceding year. A site had been selected and purchased for $670,000. To insure adequate light and ventilation, it was decided to buy extra ground fronting on Broad Street at the rear of the building. Many people and estates had interests in the various tracts that were wanted and some were unwilling to sell. Marketfield Street, a narrow thoroughfare, and Public School No. 15 were both in the area sought and an act of the state legislature was required to get title to them. Eventually, however, all these details were worked out and the ground was acquired.

The next step was to ask ten architects to prepare designs for the projected building. Each was paid $500 for his work. The four plans that the committee considered best were submitted to the members for a vote. They chose the design prepared by George B. Post. Except for the trading room, which was 47½ feet high, the structure was divided into office spaces. Many tenants had been signed up before construction started. The Pennsylvania Railroad was first on the list and through the years many of the nation's leading rail lines, as well as steamship companies, have had offices there at various times. Many of the members of the Exchange and also large firms interested in either buying or selling the commodities traded in have also been tenants.

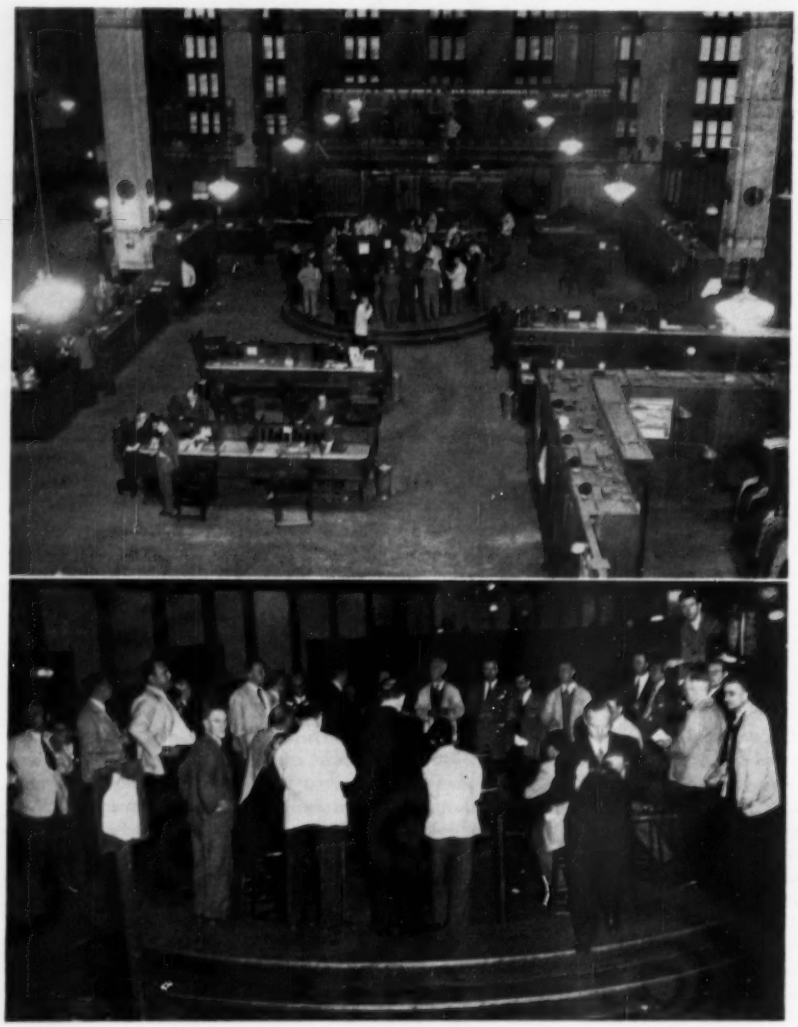
Proof that building costs were going up even in those days is found in the fact that the committee had at first had hopes of putting up the structure for around $1 million, or about one-third of its eventual cost. Contributing somewhat to the increase was the decision to use iron "in place of cheaper materials."

The cornerstone laying on June 6, 1882, apparently was a routine affair, but the opening of the structure in May, 1884, was a gala occasion that extended over portions of 3 days. The main speaker was Chauncey M. DePew, the reigning orator of the day. He called the new building a "palace of commerce," and predicted that it would provide for all the "present and prospective needs of the Exchange."

A. E. Orr, secretary of the building committee expressed the opinion that "from an architectural standpoint, our building stands unrivalled in this or any country of the Old World." He dedicated the building "to the god of seedtime and harvest," because the foundation of commerce is agriculture. He characterized as new the idea of including offices in the building for revenue purposes. All the offices but one had been rented, insuring an annual income of $177,000. On May 5, there was a promenade concert and ladies' reception, and the finale of the 3-day observance was a grand ball on the floor of the trading room.

Members of the Exchange comprise persons or firms allied in some way with the buying, selling and shipping of basic commodities. About half of the current membership of around 515 are in the brokerage or commission business. Another group of about 75 includes representatives of steamship lines, railroads, and other carriers. The remaining members are large processors of cottonseed and soybean products.

The commodities traded in consist of grains, seed, feeds and flours and all the various fats and oils, edible and inedible. Futures markets, with which about half of the membership is concerned, are conducted in cottonseed oil, soybean oil and tallow. In addition, all commodities listed are traded on a cash basis. Futures markets have an important role in commerce and industry. For instance, a renderer of tallow may buy his supply for



TRADING ROOM

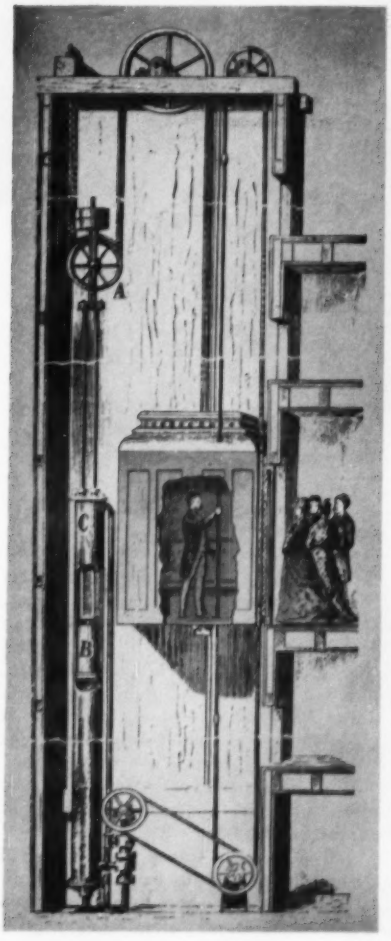
Portion of the 220x144-foot enclosure (top) in the old building where transactions took place. At the bottom is a close view of the ring where trading in vegetable oils and tallow was conducted.

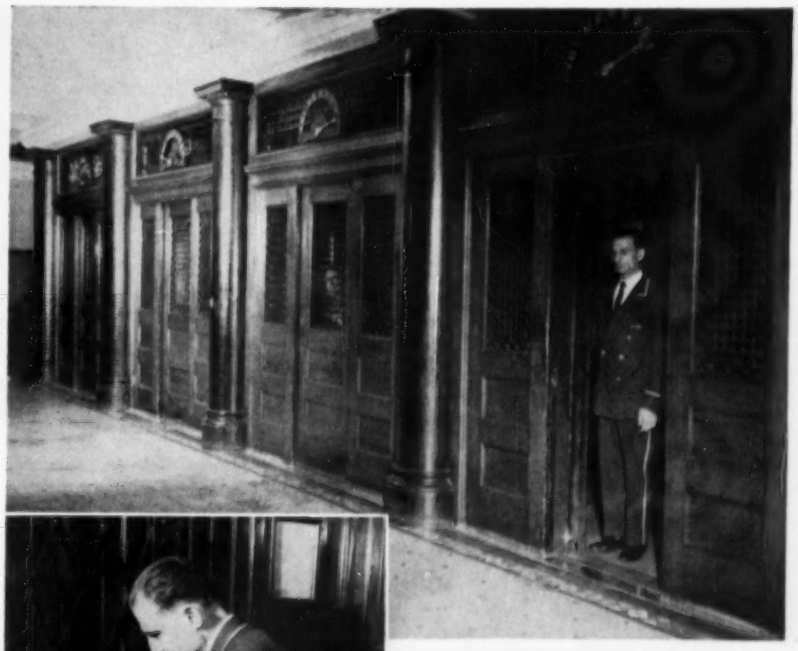
delivery months hence and thus know in advance what his cost will be. The cash or actuals price and the futures price normally move fairly close together and even though he has his futures contract, the processor will usually buy tallow in the cash market as he needs it. Each time he does this, he will sell an equivalent quantity from his futures account. The futures market can also he used for "hedging." If the processor's sales lag and inventory piles up dangerously, he can sell tallow in the futures market. If the price then declines, he is protected.

Likewise, a supplier of tallow can sell in advance, selecting a time when he considers the price favorable and thus protecting himself against possible loss. In a futures transaction the only fixed conditions are the price and delivery month; in a cash transaction all the conditions are fixed. The New York Produce Exchange is largely an export market. Although large, it is exceeded by others. Chicago has the largest futures market and Minneapolis the largest cash market.

HOW ELEVATORS OPERATED

Sectional view (below) furnished by Otis Elevator Company that shows the principle of operation. The car was suspended by from four to six wire ropes that passed over a fixed wheel at the top of the shaft and thence under a wheel (A) connected with the piston rod of a vertical cylinder (C) and then running upward to a point of attachment at the top. The piston, made heavier by weights at its top, about balanced the weight of the car, reducing the power required for movement. The operator started the motion with upward or downward tugs on a wire rope passing through the car and connected to valves of the hydraulic system at the bottom of the shaft. The valves admitted water under pressure to either the top or bottom of the cylinder as desired and thus moved the car up or down. The cylinders of the Produce Exchange Building elevators ranged from 37½ to 41 feet in length. Eight of them were 18 inches in diameter and three were 30 inches.





SOME OF THE LIFTS

Although long outmoded, the eleven hydraulic elevators served unfailingly for more than 7 decades. An operator is shown (above) starting a car by tugging on the control cable.

For the duration of the demolition and construction period, the Exchange has moved up Broadway to No. 42, where it is occupying ground-floor quarters. Operations there are cramped into 6000 square feet of floor space, as compared with the 15,000 it vacated. In the new structure it will have 20,000 square feet and the trading room will extend through two stories.

Although it will not own the new building, the Exchange is retaining title to the ground, located close to the financial district and one of the most valuable parcels in Lower Manhattan. It has given the builders, Uris Brothers—Percy and Harold D.—a long-term lease on the plot. In addition to carrying on extensive building and realty activities in New York, Uris Brothers are constructing the $100-million Penn Center development in downtown Philadelphia. The base of the new No. 2 Broadway structure will cover 58,000 of the total area of 73,000 square feet. As the building rises there will be some setbacks and each upper floor will have an area of about 16,000 square feet. The schedule calls for occupancy by January 1, 1959.

The old building is being razed by Lehigh Salvage Corporation and Jake Klotz, Inc. In general, the dismembering operations are starting at the top and proceeding progressively downward, the materials being either chuted to the sidewalk or lowered by derricks. Air-powered tools are used effectively for breaking up masonry, concrete, etc.

IN THE FIELD

Truckload of Oklahoma students leaving camp on a field trip (right). In the foreground at the centerfold Dr. Louis F. Dellwig, director of the Kansas University camp, is shown (left) with instructors James Sorauf and John Mann. Students on the rock in the background have set up a plane table station looking across a canyon to a group on the opposite crest. They are shown at close range below. The student with the surveyor's rod (lower right) is Earl Bahnmaier and beside him is Bill Cullen.

On the Trail of Stray Strata

Every Summer College Geology Students Swarm Into Colorado for Field Work

CAREY HOLBROOK

IF YOU walk through, and lose one of the Crinklys* in Hall's Meadow, you may pick it up again farther on, or it may fizzle out altogether."

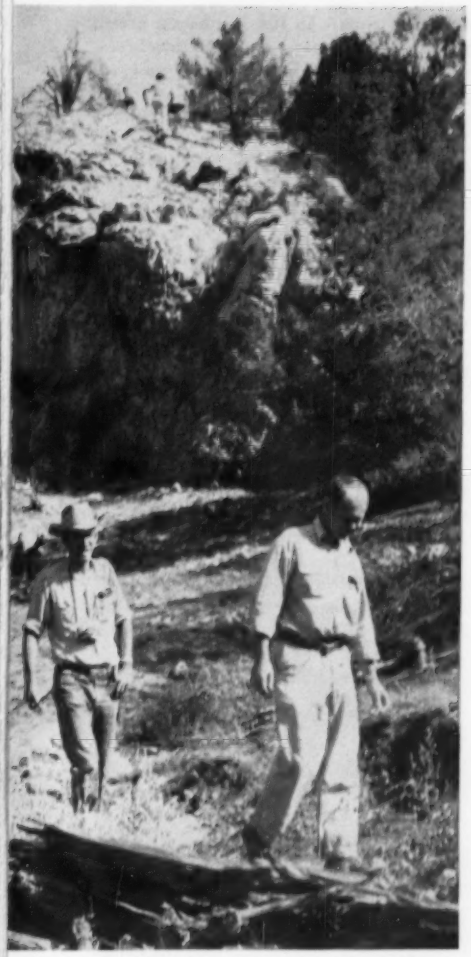
That's what Dr. Carl A. Moore, director of the Oklahoma Geology Camp was telling his students one morning last July. They were on one of their regular field day assignments, part of the 4-week course given every summer to junior and senior students of geology at the University of Oklahoma, located at Norman, and Oklahoma Agriculture and Mechanical College, which is at Stillwater. These boys had ridden into the foothills from their permanent camp, located in Fremont County, Colo., not far from Canon City and Florence. They were brown and hard from tramping the mountains under a high-riding sun.

*A sedimentary rock formation, usually red or pink and of characteristic wavy structure, that is found along the eastern base of the Rockies.

These Oklahomans were not the only geology students then on the trail of a wayward "Crinkly" in Fremont County. Students from other states and other universities were also roaming the mountains with pointed steel hammers in their hands, and, in their heads, dreams of good jobs as working geologists when graduation day had come and gone. For Fremont County is particularly inviting to those who would learn about rock formations and strata. This is so because "the rocks are so well exposed and complete sections of a large number of formations may be found, from granite—which is Pike's Peak granite here—right on up through the geological column of stratified rocks." The words belong to Dr. Moore.

Consequently, several universities have permanent camps in the district, and others schedule regular study trips for their geology students. In fact during the summer, in Canon City or Florence, you are likely to stumble over half a dozen PhD's in any block, and there is no way of telling them from the students who are to be found in greater numbers. Both wear the same garb, which includes a pair of Levi's and some sort of high-topped shoes.

The Oklahoma Camp is operating in its eighth year in this location. The director for six of those years has been Dr. Carl A. Moore, a soft spoken prof-



essor who can drive a truck carrying students to the field, teach them what they need to know in class, or preside over a religious meeting at the First Baptist Church in Canon City, with equal authority.

Three groups of students are scheduled for the camp every year, each one staying 4 weeks. Seventy were in attendance last June, 33 in July and 85 in August. This is a required course for graduation.

While Dr. Moore is director of the camp, and carries the big load of teaching, he always has some capable assistants on his staff. In June they were Dr. V. Brown Monnett, head of the geology department, and Dr. Alex R. Ross, both of A & M, and Dr. Wm. Pitt of the University of Oklahoma. His instructors for the other months were equally as high ranking.

Seventeen 16x16-foot cabins are available to house students and faculty. The mess hall, kitchen and office are all under one roof, and are permanently wired, the current being taken from the Southern Colorado Power Company line that runs by the camp. The water supply comes from a well, equipped with an electric pump, and hot water is plentiful for showers and kitchen use.

Meals are prepared in the camp kitchen presided over by Mr. and Mrs. John Haning, who are regular employes of A & M College at Stillwater and come out with the students at the beginning of the June session. They are served cafeteria style, and each student washes his own tray and dishes. Work in the kitchen and dining room is assigned to different students in turn, but all the cabins must be kept in order by the occupants. The mess hall also serves as an assembly room for classes or any other gatherings.

The camp is located on leased land, because of a law that prevents the schools from owning realty outside their state. Title to the buildings and equipment is held in the name of the Oklahoma Geology Camp, and the entire cost of construction, reduced by volunteer labor of students and staff members, has been defrayed with student fees.

The charge to a student for the course is $3 per day, which covers board, room, transportation and many incidentals. The tuition for a resident of Oklahoma is $28 for the term, and for a non-resident $72. Out of the $3 charge enough surplus is accumulated to improve the camp each year.

The one major problem, according to Dr. Moore, is how to keep squirrels out of the cupboard. They live in crevices in the rocks, holes in the arroyo bank, and under logs. Whenever a back is turned they swarm out, looking for a crack to wiggle through. And what one squirrel can do to a shelf-full of dry cereal is really breath-taking. Two of them can wreck the kitchen before the cook can get back from the mail box. Dr. Moore is thinking of including a course in squirrel eradication along with his geology next year.

The oldest geology camp in the county—established 35 years ago—is maintained by Kansas University and located on leased land about 12 miles from Canon City on Four Mile Creek. It is equipped to take care of 40 students and the staff. Four permanent dormitory cabins have a capacity of ten students each. A home for the director is equipped with electric lighting, cooking and refrigeration facilities. The camp has its own water supply, with hot and cold water in the bath house, and there is a recreation building.

Director of this camp in 1955 and 1956 was Dr. Louis F. Dellwig. The instructors were James Sorauf, Stuart Grossman, John Mann and Bob Kulstad, each of them working for either his doctor's or master's degree. The entire project is under the direction of M. L. Thompson, chairman of the school's geology department. The summer course runs for 5 weeks and is required work for all geology students. For com-

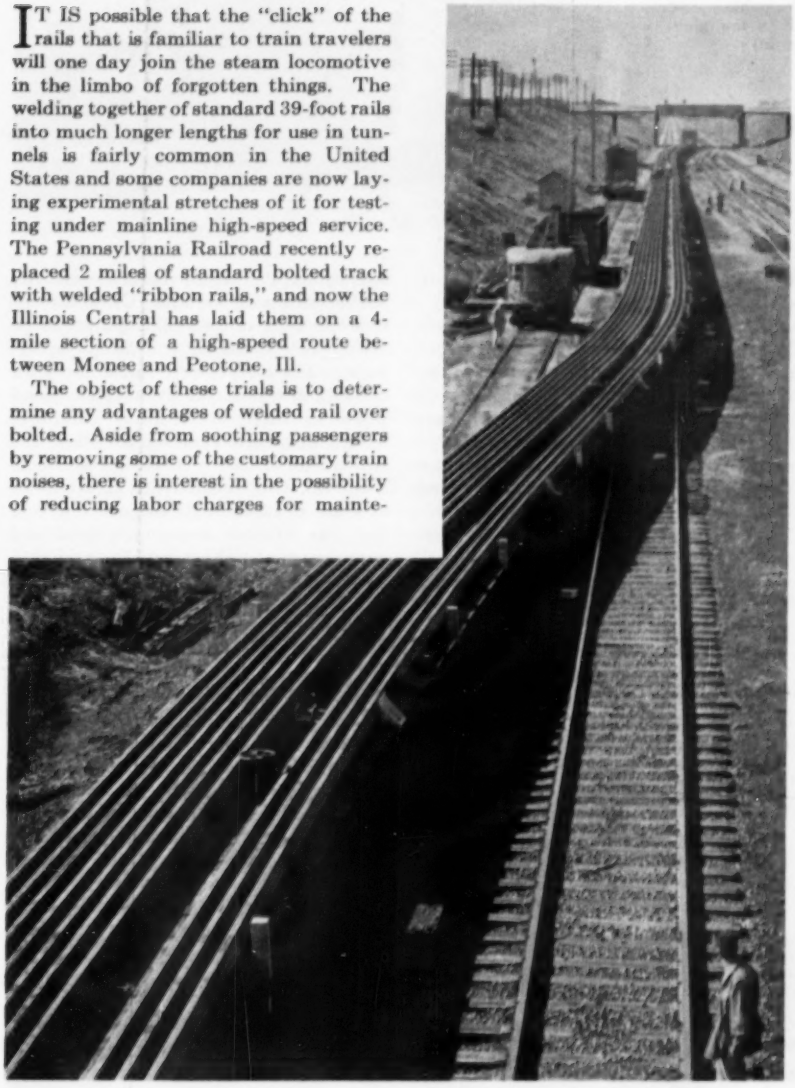
GROUP FROM LOUISIANA

Faculty staff from Southwestern Louisiana Institute (left) grading examination papers at the end of the 1956 course. From the left they are Ned Boudreaux, Prof. Louis Gimbrede, camp director; Robert Schipf and Walter Trenchard. The other picture shows students in class in the high school gymnasium at Florence, which served as headquarters.

Clicking Rails May Be on Way Out

IT IS possible that the "click" of the rails that is familiar to train travelers will one day join the steam locomotive in the limbo of forgotten things. The welding together of standard 39-foot rails into much longer lengths for use in tunnels is fairly common in the United States and some companies are now laying experimental stretches of it for testing under mainline high-speed service. The Pennsylvania Railroad recently replaced 2 miles of standard bolted track with welded "ribbon rails," and now the Illinois Central has laid them on a 4-mile section of a high-speed route between Monee and Peotone, Ill.

The object of these trials is to determine any advantages of welded rail over bolted. Aside from soothing passengers by removing some of the customary train noises, there is interest in the possibility of reducing labor charges for maintenance in view of reports that 40 percent of the track work takes place in the vicinity of the bolted junctions of standard rails. Another goal is to check the truth of statements that, despite recent improvements, jointed rails are not as strong as welded ones. With the welded variety the expense of assembling and maintaining joints is obviously lessened.

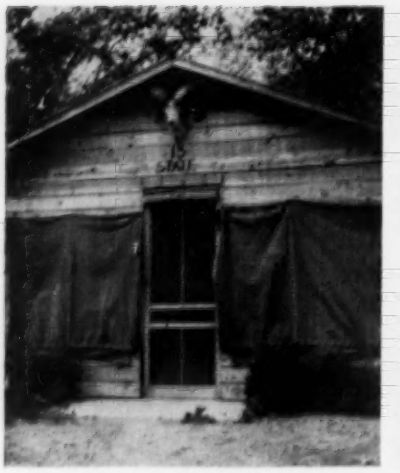


The 1443-foot rail laid by the Illinois Central was made by welding together 37 standard 39-foot lengths weighing 140 pounds to the yard. When they had been assembled, there was the problem of how to transport the kingsize sections to their destination. A train of flat cars as long as the rails was made up and positioned on a stretch of straight track. A string of rail was pulled aboard with the aid of a threading device at the end of one car and a series of rollers. Ten strings were thus loaded and transported at one time, anchored at intervals so as to give them freedom to bend in negotiating curves. Thirty strings were thus hauled to Monee and unloaded, two at a time, by pulling them off the rear as the train moved slowly away.

Air-operated equipment assisting in the track-forming operations included a device that gauged tie plates accurately to receive the rails as they were moved into place by locomotive cranes, and drivers of the spikes that secured them to the ties.

STEEL SPAGHETTI

Ten rails, each 1443 feet long, en route (left) to their destination, bend with the curves. To unload them two at a time (below), a crane pulled them through threaders on the end of the rear car and others on the "caisson" shown. The ends were then anchored and as the train moved away, towing the caisson with a wire rope, the rails were laid on the ground on either side of those they were to replace. With unloading operations spread out over a quarter-mile, communications were maintained by walkie-talkie (above).



OKLAHOMA STAFF CABIN

The skull of the big horn sheep was found by the group in the mountains nearby.

pleting it, they get 5 hours of credit, which is the same as for a full laboratory course for one semester or 5 hours a week in class for 16 weeks.

For this 5 weeks, a student, if he is a resident of Kansas, will probably pay out about $150. This will include the cost of transportation, room and board, and incidentals. Meals are taken at a nearby ranch, which also supplies the students with lunches to take into the field for their midday meal.

The Phantom Canyon highway, laid on the roadbed of an abandoned railway, twists its way out of Cripple Creek, and finally tumbles down into Canon City and Florence. Along this route are high bridges, dark tunnels, and narrow curves hanging over canyons that fall straight down from the roadside. Those tourists who come drifting down the canyon, with their hair standing on end, are liable to run smack into a bunch of budding geologists squinting through instruments or peering around for a vanishing "Crinkly." This group would probably be some of the students from Southwest Louisiana Institute, who find Phantom Canyon a likely place to look for stray strata.

Southwest Louisiana Institute is located at Lafayette, La., and has an enrollment of about 4000. Last year was the second that its geology class worked in Fremont County, and 48 students were there. Many of them were married men and brought their families with them, finding apartments in town. Unmarried members were quartered in the high school gymnasium at Florence, thanks to the efforts of the chamber of commerce of that city. Director of the camp was Prof. Louis Gimbrede, with Ned Bourdreaux as assistant director and Walter Trenchard and Robert Schipf as instructors.

With no base camp for their accommodation, the students had to make their own arrangements for meals, incidentals and even transportation. They drove their own cars and most of them ate at restaurants in town. Tuition for the 8-week course was $50 and there was a $10 laboratory fee. A 1-week sightseeing tour of Colorado after the session ended was also included. All of these factors added to the cost, which probably ran around $400 per student. Negotiations are now under way to establish a permanent Louisiana camp in this section. It would accommodate not only the students of Southwestern Institute but also those of Louisiana State University, at Baton Rouge, who had a camp in 1956 near Colorado Springs.

Two differences may be noted between the boys from Louisiana and those from other sections. In the Louisiana group you are apt to hear a conversation break into a sputter of French verbs and adjectives, and then slip back into the slow and musical speech of the South. Many of the boys speak as much French in their homes as they do English.

For the second difference hark to Prof. Trenchard. We were trudging up a hillside on the way to the ruins of an ancient stone structure that was probably used as a lime kiln more than 50 years ago. After a few steps the professor stopped to get his breath and remarked, "Ah don't believe in rushin' around, especially when you are packing a little extra weight. When Ah get weary, Ah stop and rest under one of those little ceda's over there!"

Still other groups of geology students have regular summer sessions in other sections of Colorado. At Beulah, in Pueblo County, Kansas State College, located at Manhattan, held a summer course in 1956 lasting 5 weeks, with Prof. Henry Beck as director and 25 students attending. This was their second year at that location. The school rents an old riding academy building for quarters and carries on about the same work as that done by the students of Kansas University. This is also a required course for graduation.

Near Colorado Springs, in addition to Louisiana State University, the University of Iowa had a camp last year and there were probably more. On Wild Horse Mesa, not far from Pueblo, Colorado School of Mines student geologists were camped in 1956 with 50 or 60 undergraduates enrolled, and Prof. Larry Ogden as camp director.

In Colorado the students can, if they wish, also brush up on mining geology. Cripple Creek, world known gold camp, is right handy in the adjoining county to Fremont.

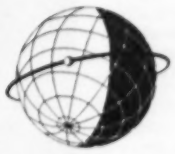
CAMP OF KANSAS UNIVERSITY

There are four cabins, each with accommodations for four students. They are simply furnished and beds are of the double-deck type (right). Meals are eaten at a ranch a few miles away. This is the oldest (35 years) of the camps.

THE INTERNATIONAL GEOPHYSICAL YEAR

BEGINNING July 1, leading scientists from 46 nations will participate in a unique effort to find out more about the world in which we live. For 18 months they will gather information, making observations from some 1800 semipermanent stations and 81 ocean-going vessels flying flags of twenty nations. The program is known as the International Geophysical Year and is scheduled for a period during which great disturbances in natural phenomena are forecast, chief among them being the greatly increased activity of solar flare-ups or sunspots. The last 12 months of the period also happen to coincide with the seventy-fifth anniversary of the first such effort to gather data about the world. In 1883 some of the most learned men of the times got together and decided to do something about the fact that a great deal of the earth's surface had never been seen by the eyes of civilized man, much less thoroughly explored and mapped. They spent a year gathering data from the polar regions. This session was called the First International Polar Year. Fifty years later the Second Polar Year was organized and even though it came at the bottom of a world-wide depression, still produced a great deal of valuable information about this planet.

Now, with 25 years of additional experience behind them and with new tools, methods and capabilities, the scientists think the time is ripe for a further assult on the unknown. To reflect their broadened interests and the necessity of getting more complete information, not only about this planet but the universe, the name was changed to incorporate all geophysical phenomena. Polar explorations and investigations will comprise an important part of the program—54 stations either have been or will be established in Antarctica alone—but by no means will the polar ice caps be the only areas under surveillance. There are 13 disciplines and areas of activity that will be covered in the current IGY, as it is known.



SYMBOL OF IGY

The International Council of Scientific Unions has adopted this symbol as the official emblem of the International Geophysical Year. It will appear on all reports issued by the various cooperating national groups. It depicts the satellite on its path around the earth.

Our sun, in many ancient and even present-day religions, has been called the father of us all, for without its light and warmth, life surely would never have developed on this planet. The sun seems to have life of its own. At times, great perturbations boil up on the surface of Sol and huge flaming spires of gas protrude thousands of miles from the main corona. For some reason, which scientists hope someday to determine, they are more plentiful and greater in severity at the end of 11-year cycles. The current IGY is scheduled for the close of one of these cycles and it is believed that Sol will put on quite a show for his observers.

According to texts, the bombardment of earth's atmosphere by charged particles streaming from the sun gives rise to the aurora borealis (Northern Hemisphere) and the aurora australis (Southern Hemisphere). The auroras actually are the luminous trace of these particles in the atmosphere. As they approach the earth they are deflected by the earth's magnetic field toward the magnetic poles and that is the reason that auroras usually can be seen only in high latitudes. During the IGY, systematic observations of auroras will be made in both the Arctic and Antarctic and a major effort made to establish time correlations between displays in the two hemispheres. If simultaneous auroras do occur, it is believed that significant theoretical advances may be made explaining the nature and origin of incoming particles (not all scientists agree that they come from the sun) and the effect of the earth's magnetic field on them.

Another light, similar in some respects to an aurora, appears in all parts of the sky at varying intervals and with widely varying intensities. The whys and hows of this phenomenon, called airglow, are other questions the researchers hope to answer during the current expeditions. They believe that it is caused by chemical reactions in the atmosphere, rather than being a result of particle dispersal. Rays coming in from outer space, however, may initiate the reactions.

Still another type of stellar bombardment which will come in for extensive study is that of cosmic rays. Their existence has been known for nearly a half-century, but what they are and whence they come, remain uncertain. The answers to those questions are of major importance in understanding not only the universe but our own small part of it. We know today of two different varieties of cosmic rays—so-called pri-

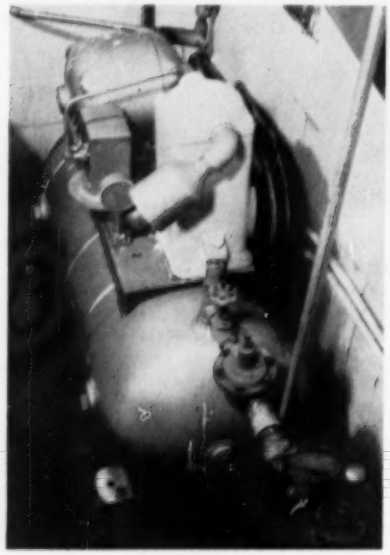
EXPECTED ORBIT OF THE SATELLITE

The expected and planned orbit of the IGY earth satellite will be inclined about 40 degrees from the equator, permitting it to revolve around the earth in an apparent latitude range of 40 degrees north and 40 degrees south. It will make a complete loop every hour and a half and the earth will rotate underneath it about one-sixteenth of a complete revolution. This means that the satellite will apparently shift its orbit (at the equator) 25 degrees west each time it circles the globe. (Although one-sixteenth of a revolution actually is 22.5 degrees, the apparent shift will exceed that value by about 2.5 degrees because the satellite will follow an elliptical path.) There are two major advantages to this flight path, according to the scientists. First, the satellite's instruments will get a good look at a much broader range of the upper atmosphere; and second, scientists from a great many more nations will get a chance to observe the tiny moon than if it were to follow an equatorial route.

GOOD SERVICE RECORD

The 1-hp motor-driven Type 30 compressor (below) has operated 11,000 trouble-free hours, furnishing oil-free air for pumping milk in the plant of Harrisburg Dairies (right).

Pumping Milk With Air



OIL-FREE air from one small compressor has transferred approximately 110 million pounds of milk from storage tanks to filling equipment during the past 3 years at Harrisburg Dairies, Inc., the largest establishment of its kind in central Pennsylvania.

The lone compressor, an Ingersoll-Rand unit with a non-lubricated cylinder and 1-hp motor, required no maintenance during this period of nearly 1100 consecutive days of operation and there were no breakdowns or interruptions of service. The machine runs 10 hours a day, 7 days a week the year round and has logged a total of 11,000 hours.

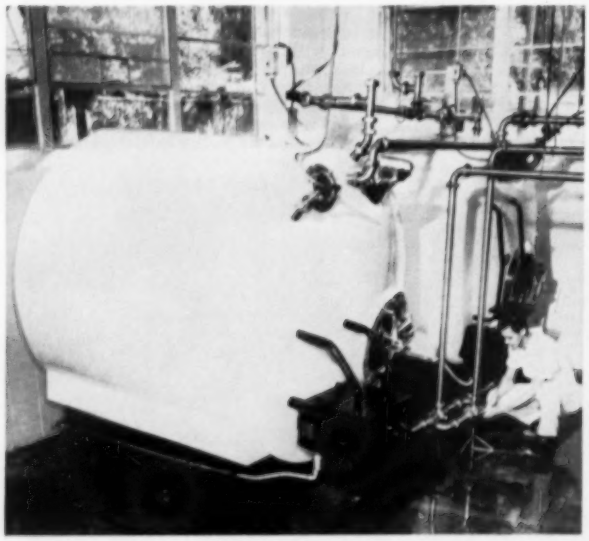
Air from the compressor, at 7-psi pressure, forces pasteurized milk, skim milk and buttermilk to their destinations. The functioning of the entire dairy depends upon its continuous operation.

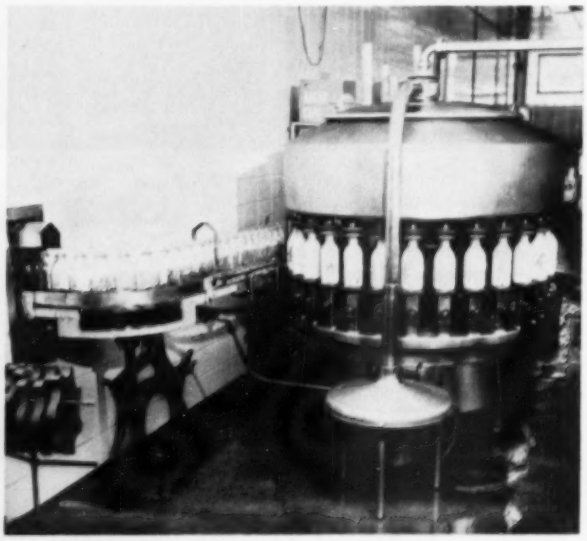
Before the compressor was installed, two centrifugal pumps moved the milk within the plant. The main objection to pumping with them was a tendency to break up the butterfat globules and lower the cream content of the milk. Occasionally the lines would become air bound and interrupt production.

The dairy occupies a single-floor plant. Although the compressor also supplies air pressure for moving skim milk and buttermilk, its biggest job is to push the pasteurized milk around. Clean air enters the tops of two 1000-gallon surge tanks just ahead of the filling equipment. The air pressure forces the milk out of the tanks and through overhead pipes to three bottle-filling machines having aggregate capacity for filling the equivalent of 265 quart-size containers a minute. One machine fills glass bottles at a rate of 130 quarts a minute, a second one fills 65 quart-capacity paperboard containers and a third one 35 paperboard containers of ½-gallon size.

Air from the same compressor pushes skim milk a distance of approximately 100 feet from a storage vat to two 500-gallon tanks in the cottage cheese department, and buttermilk from storage into a 500-gallon vacuum vat.

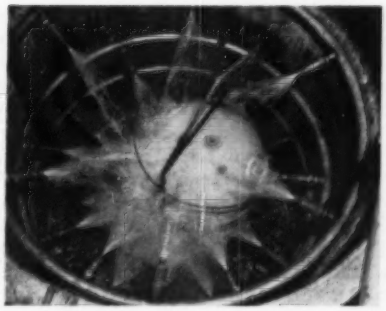
The compressor has increased the plant's filling capacity, the oil-free air it delivers has no ill effect on the cream and there is assurance that every bottle will be completely filled. Also, the possibility of the lines becoming air bound has been eliminated.





STORAGE TANKS AND BOTTLE FILLER

Pasteurized milk is stored in two 1000-gallon tanks (left) and then pumped with air to the bottle-filling machine at the right. The air enters the tops of the tanks and forces the milk out at the bottom and thence through overhead piping to the machine. Pumping with air by displacement has no effect on the milk whereas the centrifugal pumps formerly used tended to break up the globules of butterfat and lower the cream content. The method was changed when the plant was modernized 3½ years ago. The one compressor does the work that required two pumps.



SHOWER BATH FOR TANK

In building the Vanguard launching vehicle, Martin engineers were confronted with a problem of heat-treating several closed high-pressure tanks of corrosion-resistant steel to 970°F and then giving them a quick cold quench. Rather than trying to figure how to submerge such a buoyant object that was too hot to handle, they rigged up the shower that is shown. It consists of many nozzles attached to a circular pipe arranged around the inside wall of a large tub. The device cools a tank quickly and evenly.

Oceanography can be called the study of three-fourths of the earth's surface for that is the extent of oceans and lakes. The main objectives of the oceanographic program are to measure the motion of waters in the depths of the sea and to record the variations in water levels. The first will reveal how long it takes for the cold dense water of the polar regions to flow to the equator and back; and the second will show how much water is being transferred by the slow but powerful and inexorable deep currents. Circulation of the waters has a great deal to do with our weather and even climate. Furthermore, it is said that the ocean deeps will one day be our chief source of food. Some scientists are looking to the future when large quantities of radioactive wastes will be produced by nuclear power plants and studying whether or not these can be dumped into the ocean to disperse gradually and harmlessly.

This earth is sometimes called "good old *terra firma*," but according to seismologists it really isn't so firm; it is in reality rather fluid. Continual shifts take place and range from mere tremors to disastrous earthquakes. More than 250 are recorded annually in the United States alone. A concerted effort will be made to learn more about such shiftings and to determine whether or not severe quakes can be predicted, thereby reducing the damage they do. In addition, a great deal of information of benefit to prospectors for minerals and oils should also result.

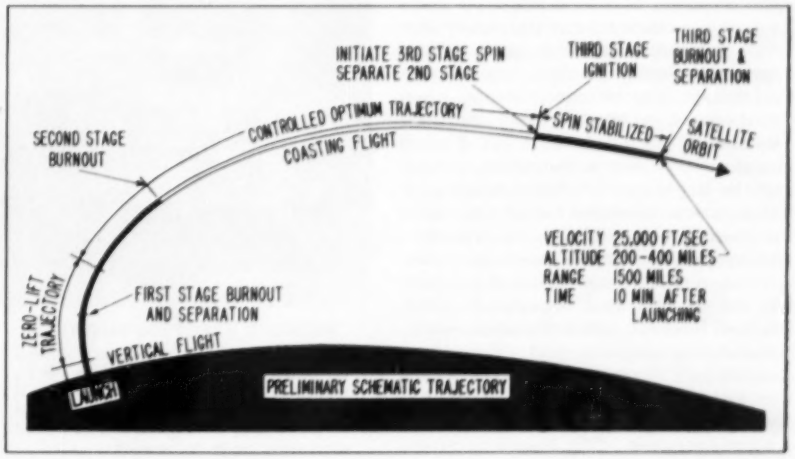
Aside from sporadic efforts at rain making, most scientists are convinced that there really is little that can be done about the weather except to forecast it accurately so that its bad results can be averted. Forecasting has long been hampered by the lack of data from broad areas of the world. During the IGY, a circle of weather stations will surround the earth in southern latitudes, thus filling in the largest of the gaps, and it is the hope of meteorologists that definitive information can be gathered.

Beyond its general composition and movements fairly close to the surface of the earth, little is known about the envelope of gases that surrounds the earth and is called air. As most of us are aware, these gases are split up into layers and one of these is to be examined extensively during the IGY. Called the ionosphere, it is made up of ionized molecules and is extremely important to us because it is from this layer that our long-range radio waves rebound and are thus distributed hundreds of miles from their source. The degree of ionization of this layer varies from day to day and week to week and in some cases disturbances or "storms" in it can disrupt our communications. Scientists hope to learn how to forecast these upsets in the ionosphere, thereby lessening their adverse effects resulting from communications failures. Auroras, air glow and perhaps even thunderstorms are directly related to the ionosphere as well.

Beyond the known layers of gases surrounding the earth is a rather hazy region about which very little is known. Some scientists feel that it is rather thickly "populated" with gas molecules and others think that it is mostly empty space. It is certainly the fringe of outer space, however, and if man is ever to leave his planet he must know more about it. So far we have been able to shoot our rockets to a height of about 200 miles. The scientists want to know what exists even above that tremendous height, say, to an altitude of 300 miles or more. This is part of the idea behind the famed earth satellites which will be launched as a part of this country's IGY program. The orbiting instruments will also answer many of our questions about altitudes of less than 200 miles, chief among those being the density of the air. For example, scientists will be able to calculate the number of molecules at any given altitude by their slowing effect on the satellites as they spiral toward earth at the end of their life. Furthermore instruments which will be carried by the tiny moons should also give the researchers a chance to examine more closely primary cosmic rays, to take readings of temperatures and pressures, to study other types of radiation in outer space and to gain a better knowledge of the effects of earth's, moon's and sun's gravitational forces by following their perturbations in flight.

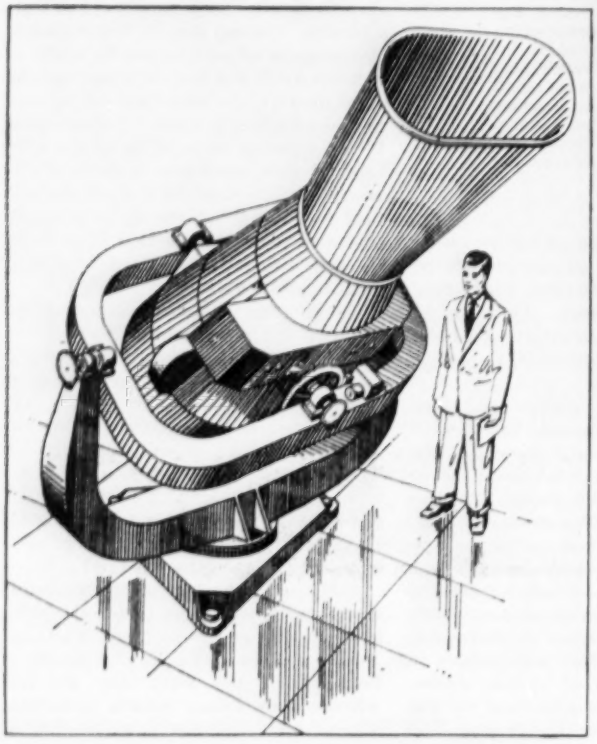
The satellites will be launched from Patrick Air Force Base on the east coast of Florida and carried into their orbits by 3-stage rockets. Stage 1, it is said, will provide a thrust of 27,000 pounds for a 2-minute period and will carry stages 2 and 3 as well as the satellite to a height of about 40 miles to an end velocity of about 3000 to 4000 miles per hour. Stage 2 will then take over and boost the assembly to a speed of about 11,000 miles per hour. Fuel from this stage will burn out at about a 130-mile altitude but the assembly will coast about 170 miles higher where the third stage will take over and blast the satellite into its orbit at a velocity close to 18,000 miles per hour. It also will start the satellite spinning on its own axis, thereby improving its flight path in much the same way as the trajectory of a rifle bullet is improved by making it spin. At that height and speed, the satellite will circle the earth once every hour and a half. It will be a sphere about 20 to 21 inches in diameter and will weigh 21 to 22 pounds. About half of the weight will be required for the structure itself, leaving the balance for the instruments.

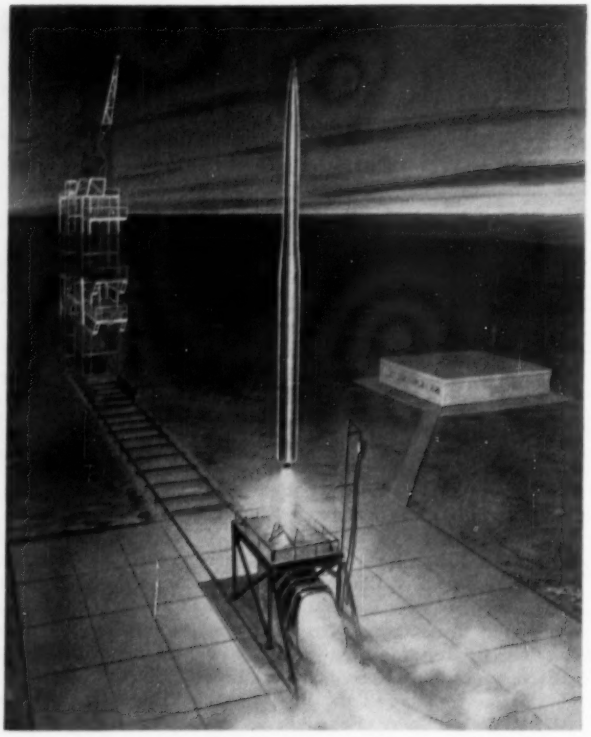
The IGY program in this country is being administered by the National Academy of Sciences. It has organized a committee, under the chairmanship of Dr. Joseph Kaplan, to handle the detail



TRACKING CAMERA

A sketch of one of twelve automatic, telescopic satellite-tracking cameras that will be spotted around the world to photograph the IGY satellite in its flight. "Shooting" the tiny moon at heights ranging from 200 to 400 miles, the uncannily accurate cameras will be able to fix the satellite's position within 10 feet on either side of the true orbit and within 25 feet along the course. The field of view will include background stars. Checking the position of the satellite against the position of the stars will reveal its exact location, provided the time at which the picture was taken is known. At each installation, a special clock, accurate to within 0.001 second, will record the click of the shutter.





SATELLITE CARRIER

An artist's conception of the blast-off of the Vanguard research rocket that will carry earth's first man-made satellite into space. At the left is the gantry crane which will place the 72-foot-high vehicle on its launching cradle. Platforms are to be provided on the gantry from which to service the rocket and to facilitate last-minute checks of its control system. On the right is a concrete blockhouse that will serve as a launching and control center and also as a vantage point from which to view the rocket during the crucial seconds after blast-off. The Vanguard is being constructed by The Martin Company, Baltimore, Md., for the United States' IGY effort. The United States Navy is in charge of the over-all satellite program.

maries and secondaries. Primaries are the actual rays reaching earth's atmosphere from outer space. Secondaries result from the collision of primaries with atmospheric particles. So far we have been able to study in detail only the secondaries—few primaries ever reach the surface of the earth. Scientists hope to find out more about primaries by means of the well-publicized earth satellite which will be covered later in this article. Other measurements of cosmic rays will be made by balloons and rockets.

At present about 80 observatories scattered throughout the world are continually checking the earth's magnetic field. From data they collected in the past, it is known that the field is fairly stable, but that there are a few minor variations. Although these involve incredibly large amounts of energy, when it is considered that they are world-wide; they rarely are great enough to affect compasses. Additional stations will be established in the gaps between present posts and it is hoped that a great deal more may be learned about these changes in the magnetic field.

Closely related to studies of geomagnetism are those dealing with the earth's gravity. The pull of gravity is sometimes different in one place than at another—even though both are the same height above sea level. This is because the earth is not a true sphere—instead it flattens at the poles and bulges somewhat at the equator. We don't know, however, exactly what shape the earth really has and it is hoped to learn more about it by establishing stations in certain parts of the world for which there are no gravimetric data.

Since we are not exactly sure of the shape of the earth, it is impossible for us to be absolutely precise about the locations of islands and even continents. During the IGY, observations will be made aimed at more closely fixing coordinates of longitude and latitude. At present cartographers can place continents within 200 to 300 feet and islands within a mile of their true position. Taking extremely precise observations from twenty stations strategically spotted around the world will, it is hoped, reduce the margin of error to only a few inches or at most, a few feet. Comparison of the figures obtained now with those to be taken in the future will enable a determination to be made of what amounts, if any, the continents are shifting in respect to each other.

Another field which will come under close scrutiny is that of glaciology. Glaciers, we are told, cover nearly 10 percent of the earth's surface, occur in the tropics at high altitudes as well as in polar climes and are, to a large extent, responsible for our weather. Fluctuations in the size of glaciers provide a clue to past and future climatic trends, it is said, and it is hoped to find in them a reliable means of long-range climate forecasting. Much of the effort will be concentrated in the Antarctic where little is known about such things as the over-all thickness of the ice sheet, etc.

controlling temperatures and a test chamber. Solar furnaces often are preferred to other high-temperature units because the temperature in the interior of the test cell is moderate, except at the focal point of the mirrors.

* * *

Crack Girdles Earth

A tremendous crack in the crust of the earth has been discovered by Columbia University geologists. Beginning in Alaska, the trench, nearly 2 miles deep, runs down the North American coast, across the Pacific and Indian oceans, around the Cape of Good Hope, northward through the mid-Atlantic regions, into and across the Arctic and ends in central Asia. Scientists are interested in the crack because it seems to disprove the theory of continental shift, that is, that all the continents once were joined and later separated and are moving apart even today, because the crack only occasionally follows the lines of separation between the continents.

* * *

Largest Construction Contract

The contract covering the erection of Priest Rapids Dam on the Columbia River in the State of Washington is said to be the largest ever awarded for a construction project. It totals almost $92 million and is held by Merritt-Chapman & Scott Corporation, which was the low bidder. About $57 million is allotted to construction and the remainder to the purchase and installation of powerhouse equipment, insurance, etc. A time limit of 1900 days has been set for completion. This is a year longer than was figured to be necessary, the additional time being allowed to take care of unforeseen delaying factors such as floods. The contractor can be penalized up to $24,000 a day for exceeding the limit or given a bonus of up to $10,400 daily for finishing ahead of time. If the firm can hold to a schedule of 1500 days it has drawn up, it will collect about a $4 million bonus.

The 9312-foot-long dam will have earth embankments at either end and a 2500-foot central concrete section in which will be incorporated a powerhouse that will initially contain eight 83,000-kva generating units and provide room for two others. Excavation is estimated at 3,239,000 cubic yards, including 760,000 in basalt rock for the powerhouse. The powerhouse site will be enclosed in a cofferdam to permit working the year round. Over the remainder of the river width, most of the work will have to be done during the months when the stream flow is low. As floods can occur without warning, there is an element of chance in the undertaking. Preliminary operations of building a 15-mile access road to the site from Beverly, Wash., and assembling material and equipment began last July, when the contract was awarded.

Priest Rapids is one of two dams being sponsored and financed by the Grant County Public Utility District. The second one, to be named Wanapum, will be 18 miles farther upstream. Over-all cost of the structures is estimated at $166 million and bonds totalling that amount have been issued. They are backed by contracts with twelve utilities of the area to market the power.

* * *

Uncle Sam Has A Heart

The cut below shows an unstamped letter we recently received. Where the stamp should have been was a tell-tale broken line of red ink, indicating that the envelope had passed through a metering machine

with something on top of it that had prevented complete registration. The nature of this shield was revealed by a cryptic penciled scrawl, "Stuck Letter" on another area of the envelope. This was interpreted to be the mail handler's way of explaining that two envelopes went through the machine together and only the top one received the inked impression.

On the opposite side of the envelope we discovered an Englewood, Colo., postmark—evidence that the letter, mailed in Pittsburgh, Pa., had traveled piggy-back to the Denver suburb. It was probably dislodged when it and its host passed through the canceling machine there.

New York newspapers recently pictured and described an envelope that went through regular postal channels there bearing a Christmas seal stamp. On ours there was no stamp. Uncle Sam detected the omission, realized that it came about accidentally and chose to deliver the letter. Little things like this take some of the sting out of paying income tax.

"He said over his dead body . . ."

* * *

It's A Screwy World

A basic law on which physicists have based many calculations and theories has been proved wrong within the last few months. Known as the "law" of symmetry, or conservation of parity, its basic precept was that there is no right or left handedness in Nature. Recently three different groups have made experiments to determine whether or not the law is indeed supported by newly found facts of the atomic world. The conclusion is that it is not, and thus the world has an intrinsic handedness: on the atomic and mesonic levels, Nature exhibits a preference for one direction rather than another. The upset of the concept poses some problems to the physicists, but on the other hand opens up new vistas for theoretical advances in which ideas need not be bound by the parity law. The question naturally arises as to whether Nature is basically right or left handed. In the tests recently finished, she seemed to be a southpaw. Actually the direction preferred is literally a screwy one—the forward travel and rotation of a left hand screw being the closest common movement to which it can be compared.

* * *

Will Trail Caribou

Seeking the reasons for a sharp decline in the caribou population in Canada, four 2-man teams will follow the herds for 18 months, moving with the animals between winter and summer feeding grounds. They will check the mortality from disease, predatory animals, storms and native hunters. A certain number of caribou will be earmarked with metal tags so that they can be identified later and their migration patterns determined. To accomplish the tagging, the men will shoot narcotic-tipped darts into the rumps of the animals with air guns. The narcotic will render them temporarily unconscious, but will have no permanent ill effects. Recent surveys indicate that the caribou between Hudson Bay and the Mackenzie River have decreased from 670,000 to 277,000. The Eskimos and Indians rely on the herds for food and raw materials for making tents, sleeping bags and other necessities.

work of the great undertaking and gather the nation's leading scientists together for the project. Funds made available by Congress are administered by the Academy through its committee. (An appropriation of $12 million was made in 1955 for the purchase of long-lead-time equipment and one of $28 million is currently being considered.)

World-wide coördination of the efforts of all participating nations is being handled by the International Council of Scientific Unions, of which the National Academy of Sciences is the adhering body in this country. Although the IGY doesn't formally start until July 1, many steps already have been taken to insure its success. The U. S. Navy's Operation Deep Freeze, as an example, established during the winters of 1954-1955 and '55-56, IGY bases in the Antarctic.

In addition to the obvious scientific benefits resulting from such participation in an international research effort, many government officials as well as scientists believe that the IGY will have beneficial effects on our understanding of other peoples. Warren G. Magnuson, chairman of the Senate sub-committee on independent offices and general government matters which handled the appropriations of funds for the program stated, "At a time when we are inching along toward international political understanding, this coöperative effort in which 46 nations join together to observe and study geophysical phenomena comes as reassuring news."

This and That

Garage Is Bomb Shelter

A huge underground garage that can, if need be, serve as a bomb shelter, has been opened in Stockholm, Sweden, after 5 years of excavating and outfitting. In a cavern 1650 feet long and 40 feet wide, hollowed out of solid rock 70 feet below the ground surface, floors of concrete were built at three levels to accommodate 550 cars as well as servicing facilities, air conditioning and purifiying equipment and a reserve electric generating station. There is also a drive-in bank. As a shelter the space could hold 20,000 persons temporarily or 5000 for a longer time. In addition to the normal drive-in entrance, several vertical shafts have been equipped with stairways for emergency use. More than 140,000 cubic yards of rock was drilled, blasted and removed to prepare the deep-seated facility.

* * *

May Shrink Electronic Brains

According to Massachusetts Institute of Technology scientists, a device coming out of their cryogenics laboratory may cut down the massive size of current electronic brains. Working with researchers from Arthur D. Little, Inc., the MIT men have developed a tiny device, called the cryotron, that does much the same job as a vacuum tube or transistor. For the units to work, they must be immersed in liquid hydrogen, but that disadvantage is more than overcome when it is considered that as many cryotrons can be packed into 1 cubic foot of space as there are tubes or transistors in most of the larger brains. The low-temperature current controllers work because of a phenomenon known as superconductivity—the virtual non-resistance to electric current of certain metals at extremely low temperatures. Superconductivity is lost, however, when the metal is subjected to a magnetic field. To make a cryotron, a diminuitive Z-shaped wire is enclosed in a minute coil of hair-fine wire that becomes an electromagnet when energized. The base wire of the unit can be made superconductive or non-conductive at will, thus controlling current or electron flow in much the same way that a vacuum tube or transistor regulates it.

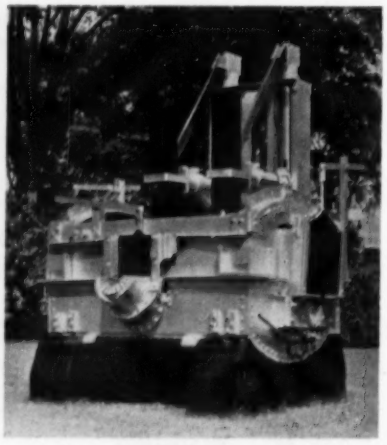
* * *

Steel's Hundredth Anniversary

Next month the Post Office Department will issue a postage stamp commemorating the beginning of the "Age of Steel" in this country. As this is being written the stamp has not been designed, but it could well bear a likeness of an air-blown converter, for the invention of that vessel made large-scale steelmaking possible. This year is designated as the centenary of the American steel age, although this is a rather arbitrary matter. The converter, which is distinguished by having been invented twice—once by Kelly in America and then by Bessemer in England—didn't actually go to work seriously for a couple of years after it was created.

Kelly proved that he had used the "pneumatic process" as early as 1851, but he neglected to patent it and the anniversary has commonly been dated from the issuance of a patent to Bessemer in 1856. That was also the year that Robert F. Mushet of England made the converter more practical by introducing another ingredient—spiegeleisen—to the cauldron. This is a compound of iron, carbon and manganese. According to one historian, steel was first made in converters in England in 1858 and in this country not until 1864, additional time having been required here to clarify the patent situation.

The steel industry also marked a fiftieth anniversary last year. On April 5, 1906, the Halcomb Steel Company, which afterward became a part of Crucible Steel Company of America, put in service at Syracuse, N.Y., the first arc melting electric furnace used in this country. It was set up and operated by its inventor, Paul L. T. Heroult of France. The furnace made it possible for the first time to produce by the ton high-quality steel that had previously been limited to 100-pound batches made in crucible pots. Electric furnaces now make up around 9 percent of the nation's steel manufacturing capacity.



PIONEER ELECTRIC FURNACE
Shown as it stands at Crucible Steel Company's works in Syracuse, N.Y., where it was originally installed. It had a capacity of 3 tons, was powered by a specially built generator and used electrodes made in Sweden.

* * *

Furnace Will Rival A-Bomb Heat

The Army Quartermaster Corps plans to erect a solar furnace at its Natick, Mass., Research & Engineering Center, that will produce temperatures as hot as those resulting from a nuclear blast. To be used for testing materials designed to protect military personnel against extreme heat, the furnace will operate on the old principle of a burning glass. The optical elements of the furnace, of course, will be much larger than any usual magnifiers and will be equipped with automatic-focusing devices and means to follow the sun. The principal parts of the new furnace will be a heliostat (flat collecting mirror), an array of concentrating or focusing lenses and mirrors, an attenuator or venetian-blind-type shutter for

Editorials

DOLLARS FROM SCENTS

ONE REASON a man we know likes a new automobile regularly is that he enjoys the fresh "new-car" smell. He likely doesn't know it, but he can get the same characteristic odor in a used car. Smart dealers in some of our cities put it into all of their jalopies with a spray gun. This psychological sales pitch is but one of the many ways in which scents are being used to boost business.

You can now buy printing inks that give catalogues, folders and other literature a smell that is related to the products advertised. For instance, travel folders can be given an aroma of pine trees or citrus fruit or some other one associated with the region being described. To fill a bakery's request, an ingenious chemist concocted spirits that give off the tempting savor of fresh-baked bread. A little of it is transferred not only to the company's sales leaflets, but also to its checks. Similarly, a perfume manufacturer uses a smidgen of his product on his checks and billheads. Department store envelope stuffers advertising perfumes, cologne, sachet powders and the like are commonly made fragrant with the odor of the product.

Stores use pleasing smells to aid in selling women's wear. Some spray perfume in the boxes containing garments; others dose the atmosphere with it and even use it in air conditioning systems, elevators and waiting rooms. One merchant put identical stockings on sale in two sections of the store. The only difference between the two displays was that one offered the hosiery in delicately perfumed containers. Sales were considerably greater there than at the unscented location.

Odors are also employed for other purposes than selling. One of the commonest such uses is to warn householders when the gas is leaking. Natural gas has no odor, so minute quantities of potent smelling, albeit non-fragrant, petroleum-derived mercaptans are put into it before it is transmitted through the distribution network.

In some cases, also, one odor is used to neutralize or overpower another one. To discourage deer from visiting apple orchards, a New York chemist produced a compound that combined the smells of a wolf and fresh animal blood. During World War II our Army put chemists to work developing something that would thwart German dogs in their efforts to track American paratroopers.

More than twenty-five American firms are now engaged in turning out odor-producing substances. Some of them also produce flavor bases for foods or beverages because flavor and smell are closely related. Perfumes and many of the other fragrance fluids derive their bases from herbs, flowers, fruits or natural oils. When these sources fail to yield what is wanted, the chemist resorts to synthesis and plays around with his laboratory stills until he gets what he is after.

SILTING OF RESERVOIRS

A READER who was told by a guide at Hoover Dam that Lake Mead, the reservoir behind the structure, receives 600 tons of silt a minute from the Colorado River and is filling up more rapidly than was expected asked us if this is true. We have it on the word of E. G. Nielsen, acting commissioner of the Bureau of Reclamation, that the rate of sedimentation is about as was predicted.

It was recalled to us that for 2 years prior to 1950 the U. S. Geological Survey and the Navy Department jointly probed the bottom of Lake Mead and determined that silt was being deposited at the rate of 105,500 acre-feet annually. If this continues, the reservoir has an apparent life of 275 years from 1935, when it went into service. However, the Geological Survey pointed out that because of the compaction of the silt as it accumulates, the filling would probably not be complete for 430 years. The deposition will not continue as at present, though, because the rearing of upstream dams authorized last year will keep practically all silt from reaching Lake Mead in future years. In fact, Mr. Nielsen expects that, with Glen Canyon, Flaming Gorge and other projected barriers in place, the water entering the reservoir will be crystal clear.

This matter of siltation received a great deal of attention before Hoover Dam was built. Some critics said the money would be wasted because the reservoir would soon fill up with solid material. Bureau of Reclamation engineers were fully aware that the Colorado was a turbid stream. Some wag even went so far as to write that the river was too thick to drink and too thin to plow. After testing the water carefully and at length, the engineers estimated that the stream would carry into the lake 105,000 acre-feet of silt annually. The Colorado River Board afterward raised the estimate to 137,000 acre-feet. The tests announced in 1950 showed that the Bureau technicians had been correct within less than one-half of one percent.

As it now appears that earnings from Hoover Dam will repay its cost of construction by about the year 2007, it is plain that it will pile up huge surplus returns for three or four centuries before the silting becomes serious. And, even if the reservoir were to fill up, the power plant could still operate. There are worse silt carriers in the West than the Colorado and even in their cases the situations are not alarming.

FUTURE LANGUAGE OF SCIENCE

THE MARKED shrinking of the earth wrought by such time and distance annihilators as airplanes, radio and other technological achievements poses many problems. If, as is claimed, no nation can longer live apart and ignore others around the globe, it follows that existing means of communication will have to be improved. Differences in language, systems of weights and measures, standards and the like are all barriers to the free exchange of ideas that is necessary for effective international scientific coöperation.

Those who think ahead along these lines are already asking what language science will use in the future. The matter has been discussed in England, where the Department of Scientific and Industrial Research is planning a national science lending library. One of its sponsors, Dr. D. J. Urquhart, has asked the Library Association to take a hand in determining the answer. His own idea is that the Chinese tongue would be the most suitable. He points out that it has no genitive, no inflections, no passive voice, in fact "no nothing."

Commenting on this suggestion and another rather startling one by Doctor Urquhart, the editor of Britain's staid *Iron and Coal Trades Review* comments: "The fact that the (Chinese) script which looks like desiccated tea leaves has to be learned and then read upwards starting from the bottom right hand (corner) of the page is dismissed airily by Dr. Urquhart. He also shakes our grammar school soul to its foundation by urging the abandoning of the teaching of Latin for Russian—'which has the same value in intellectual discipline and the added merit of being useful.' The thought of discarding our comfortable Latin tags for the more complicated versions of 'hitchevo' and the like is far from pleasant.

"It is all right for Dr. Urquhart and his DSIR colleagues. The new library is not only going to be equipped with tape recorders and electronic computers but also mechanical translators so that the old familiar Pythagoras's theorum goes in one end and comes out the other looking like Stalin's farewell speech to the Politbureau."

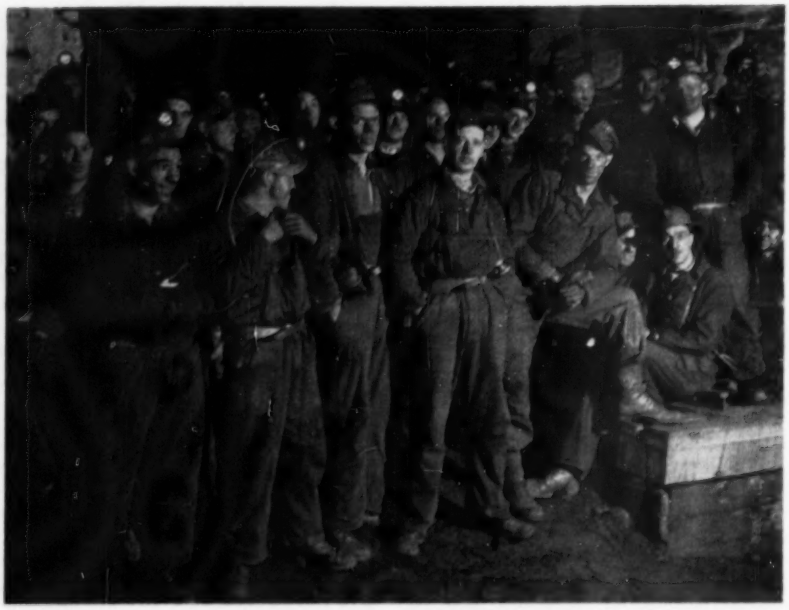
It is predicted that, in order to keep up with the world output of scientific publications, the proposed library will contain between 12 million and 18 million volumes by the year 2050. If Doctor Urquhart's suggestion prevails, probably at least a quarter of them will be in Chinese, and it is even possible that some others will be in Russian. The boy who sets out in future years to become a top-flight scientist will plainly have his scholastic work cut out for him.

Changes at Wabana Mine

MAINLY because several months elapsed between its writing and printing, the article in our February issue describing the mining of iron ore under the sea in Newfoundland by Dominion Wabana Ore Limited was not entirely up to date. We are informed that all drilling of blast holes and loading of ore are now done on the day and evening shifts. Blasting is done at night.

As mined, the ore is diluted with about 8-percent waste rock. Instead of removing this by hand picking as was formerly done, it is now separated in a heavy-media concentrator. In the ground ferro-silicon that is used as the circulating medium, the ore sinks and the lighter waste floats. Another change at the mine was the closing of a steam-operated power plant that served as a standby for delivered power. The plant had become obsolete.

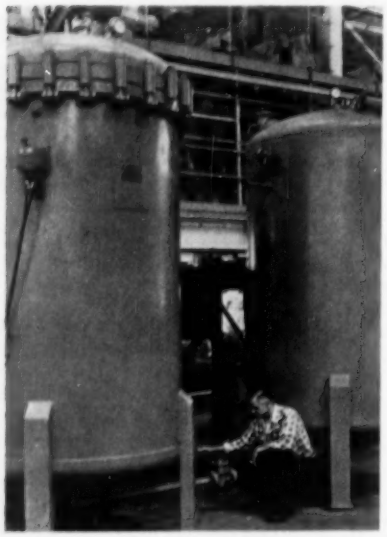
At present, the parent company, Dominion Iron & Steel Company, Limited, consumes about one-third of the Wabana output in its steel mill at Sydney, N.S. The remainder is exported, chiefly to the United Kingdom and Germany.



WABANA MINERS

Waiting at the end of their shift to be transported to the surface. These men work under the sea in rooms that may be as much as 25 feet high. Thick pillars of ore are left between the rooms to support the ground overhead.

Vacuum Impregnator For Pakistan



THESE welded steel tanks comprise a vacuum impregnating system that will soon be placed in service by the Government of Pakistan Railways at Karachi. The equipment, which is reported to be among the largest of its kind, will be used to impregnate with insulating varnish the armatures and field coils of diesel-electric locomotive traction motors in order to increase their service life and dependability.

The components to be impregnated are lowered into the tank on the left, the hinged lid is closed and sealed and virtually all of the air is removed with a vacuum pump. With it goes any moisture present within the windings. A Glyptal insulating varnish is then admitted from the 120-gallon storage reservoir on the right by opening a valve (which the operator is testing). The varnish rises until it covers the motor components, which it penetrates deeply because of the absence of air.

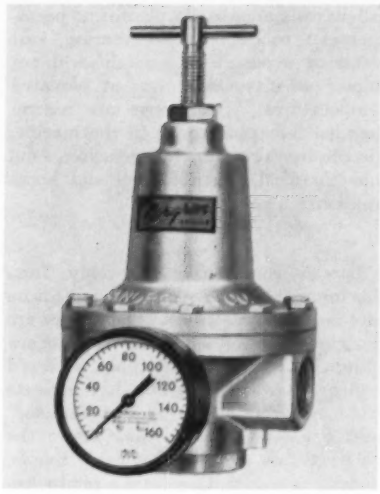
Finally, air under pressure is applied to the surface of the varnish to assist further penetration. The varnish on the armature or coil is dried by baking the piece slowly for 16-18 hours at 140-50°C. The picture was taken while the equipment was being tested in the Philadelphia, Pa., factory of F.J. Stokes Corporation, where it was built.

"He's versatile, all right. Everything he works on is too short or too long, or the wrong diameter, or out of round, or something."

TREE TRIMMING MADE EASY

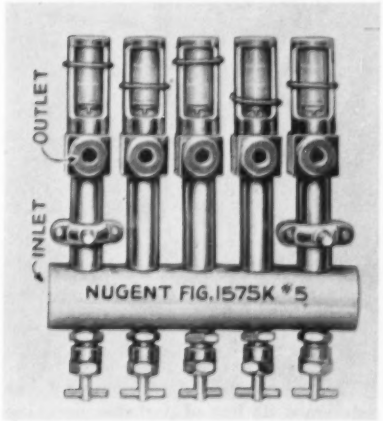
The truck-mounted rig illustrated elevates a man into position to use a pneumatic tree-trimming tool up to 45 feet above the ground. Called the Skyworker, it is manufactured by the Skyworker Corporation. A compressor is mounted on the truck and air outlets are provided in the crow's nest and also near the ground. The "outer" or uppermost section of the boom is electrically insulated with Fiberglas.

Industrial Notes



For more precise pressure control, even under situations of wide main-line air-pressure fluctuation, C. A. Norgren Company offers 20AG-X (relieving-type) and 20AG (non-relieving-type) regulators. These units provide larger air passages than earlier models, balanced valve construction, improved siphon tube action, greater effective diaphragm area and hand-removable bottom plugs for easier maintenance, and reportedly increased performance. Designed for use with water, oil and non-corrosive gases, they are available in standard pipe sizes of from ¼ to 1 inch. *Circle 1E on reply card*

Wm. W. Nugent & Company, Inc., has announced a pressure sight-flow lubricator that will deliver oil or other liquids under pressure, in accurately measured quantities, to high or other-

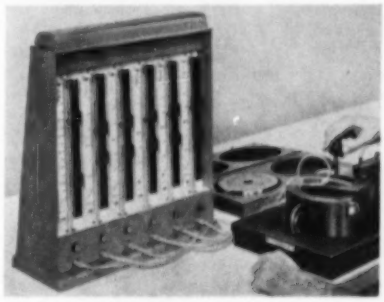


wise inaccessible points. Depending upon the number of feeds required, they are available as single units, with ¼- or ⅜-inch inlets and outlets or in multiples of 15, with inlets ranging to ¾ inch and outlets of from ¼ to ⅜ inch. According to the manufacturer, each section making up a multiple unit is capable of feeding fluid in amounts varying from several drops to 2 pints per minute by simple adjustment of individual needle valves. All units are designed for maximum working pressure of 125 psi. *Circle 2E on reply card*

A wing-type wheel brake is now available on 4- and 5-inch casters, according to The Bassick Company. These are heavy, yet inexpensive, Diamond Arrow units that are used in plate or stem construction on lightweight work stands, portable ladders, conveyors and other mobile equipment. The brake enables the wheel to be either locked securely or released with a touch of the toe.

Circle 3E on reply card

A line of multiple-column air gauging instruments with responses within 0.5 of a second, for accurate and simultaneous close-tolerance measurement of as many as eight separate dimensions, is announced by Air Gage Division of Dearborn Gage Company. According to the manufacturer, the Dearbornaire line features a self-cleaning pressure system, complete linearity over the full scale,



interchangeable component parts, 2-step amplification conversion and a 0-centered scale permitting tolerances to be read as plus or minus from the nominal dimensions. The device can include instruments with any number of columns required for a given application, but purchasers that wish to fabricate their own fixtures rather than to have them included with the order, may obtain standard 2- to 8-column multiple units from stock.

Circle 4E on reply card

A manifold designed to afford economical and efficient multiple mounting of Speed King 2-, 3- or 4-way valves in any desired combination, is announced by

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Centennial of Coal-Tar Dyes

MAUVEINE, the first synthesized dye known to man, became commercially available 100 years ago. Its discoverer, Sir William Henry Perkin, with the aid of his father, launched the vast coal-tar-derivatives industry in 1857 at the age of 18. The young chemist had discovered the dye a year earlier—purely by accident. Prior to Perkin's momentous find, the only dyes available were the naturally occurring ones—colors derived from a variety of plants, insects and animals. By the end of 1857 the mauve dye had achieved an unprecedented success. Under the trade names of Aniline Purple and Tyrian Purple, it was being used by almost all of the silk processors in England. Unlike natural colors, the new dyestuff had a controllable action that resulted in batch after batch of the same color material. Dyers also were able to produce carefully regulated gradations or shades of the rich purple.

Perkin was the son of a London builder. The father had high hopes that his son would become an architect, but at the age of 13 the lad decided on another profession. A friend showed him some interesting experiments in chemistry that, according to Perkin "seemed to me most marvelous phenomena: as a result my choice was fixed and it became my desire to be a chemist." One of the boy's teachers at the City of London School prevailed upon the elder Perkin to send the young man to the Royal College of Chemistry. There he enrolled under A. W. von Hofmann, a brilliant German organic chemist who had studied under Baron Justus von Liebig, the father of organic chemistry. Hofmann was persuaded to leave his native Germany and come to England to found the Royal College. The institution opened its doors in 1846 and was England's first school of organic chemistry. It was financed by wealthy landowners who hoped that in the new field ways could be found to increase agricultural profits.

Perkin was promoted to Hofmann's research assistant in only 2 years. He was more enthused than ever. He wrote: "Whilst assistant under Hofmann, I had little time for private work in the daytime. However, as I wished to continue research work, part of a room at home was fitted up as a rough laboratory." There Perkin worked in the evenings and during vacations and made his discovery of mauveine. Impelled by some remarks of Hofmann's he had started out to produce synthetic quinine. The young chemist knew only that the drug molecule consisted of 20 atoms of carbon, 24 of hydrogen, 2 of oxygen and 2 of nitrogen. At that time it was not recognized that the atoms had to be arranged in a special way. Perkin thought

BETTMANN ARCHIVE PRINT

SIR WILLIAM HENRY PERKIN

A portrait painted by A. S. Cope in 1906. It hangs in the National Portrait Gallery in London, England, and pictures Sir William in his laboratory holding a skein of mauve-dyed silk.

that any combination of those elements in that proportion would be synthetic quinine. He started with toluidine and attempted to add and subtract atoms by alternating oxidizing and reducing steps and other reactions. He wound up with an unpromising dirty red precipitate, a substance as unlike quinine as the toluidine he had started with.

The reaction interested him, however, and he repeated the same steps starting with aniline sulfate. This time the end product was a black deposit which he found possessed many of the properties of mauve—the natural purple dye—including its power to color fabrics. It also had a remarkable resistance to fading in comparison to natural colors. Perkin resigned his job with Hofmann—much to the latter's disgust—and went into business for himself. In 1857 he built a plant on the outskirts of Harrow—Greenford Green—and his new dye

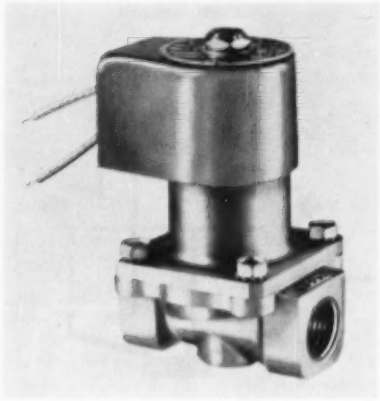
became an overnight success. He went on to produce other dyes, among them dahlia, another brilliant color known as Britannia Violet, aniline pink and the so-called Perkin's Green. In addition he was able to synthesize the natural perfume coumarin and thus founded the synthetic perfume industry. In 1874 at the age of 36 Perkin had not only repaid the money his father had invested in the business, but rendered himself financially independent. He therefore sold his factory and returned to basic chemical research. He discovered the light-polarizing properties of organic substances and thus laid the groundwork for a valuable method of analyzing them.

Perkin was widely criticized at the turn of the century for selling out his dye works because the British industry soon took a turn for the worse without his dynamic leadership. England thereby lost her early lead in the chemical dyestuffs field to Germany, which soon monopolized the business. By 1900 the manufacture of dyes alone accounted for about 20 million pounds sterling. (It took World War I to arouse the British, as well as the Americans, to the fact that the coal-tar-dyestuffs industry was a vital one—was inextricably linked to the manufacture of munitions.) It was soon recognized however, that Perkin was not at fault. In the first place the industry was flourishing when he left it and secondly it was impossible for anyone to have foreseen future developments. The brickbats hurled at Perkin soon changed to praise. In 1906 he was knighted—in an age when such an honor for a man of science was indeed rare—and received medals from the governments of France and Germany. The same year he visited America to accept various awards, including an honorary degree from Johns Hopkins University presented to him by Ira Remsen, who synthesized saccharin from coal tar. Sir William died in 1907 at Harrow.

The coal-chemicals industry today is a big one. In 1953, the latest year for which the Bureau of Mines has published figures, the value of the raw chemicals produced from coal was given as almost $360 million. It is estimated this year's sales will top the half-billion dollar mark. The huge and still growing chemical process industry, which is founded on coal chemicals and similar hydrocarbons derived from petroleum, last year turned out products valued at an estimated $60 billion. Coal-tar chemistry has been the fountainhead of a virtually endless stream of products—dyes, food colorings, inks, photographic developers, drugs, explosives and a variety of others. Perkin's work has been carried to heights he never dreamed of and the end is not yet in sight.

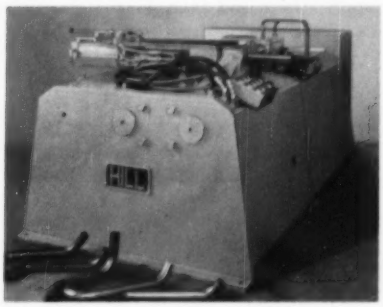
el to 1500 pounds for the battery-powered type (pictured). Standard units lift as high as 96 inches and are reportedly rugged, dependable, easily handled and safe. Catalogue No. HE-56 describes the line in detail.

Circle 8E on reply card



A steam solenoid valve introduced by Automatic Switch Company may be used in a variety of applications in heat exchangers, industrial cleaning machines, commercial dish washers, sterilizing machines and systems, dry cleaning machines, etc., for automatic control of the flow of steam, fluids or gases up to 400°F. Operated by an internal pilot the unit has a rugged forged-brass body and bonnet. Teflon disks are provided to assure tight shut-off without maintenance problems. There are no stuffing boxes or sliding glands in this completely packless fixture. According to the manufacturer, valves have low power consumption and may be mounted in any position. *Circle 9E on reply card*

Walter P. Hill, Inc., has introduced a high-speed process for bending ferrous or non-ferrous tubular parts in cases where two or more varying angles must be accurately located in relation to each other. The Hill press bender is a



5x8x3¾-foot horizontal-type, hydraulic-powered machine. One end of the part to be formed is clamped and the bend is produced by a press ram and wiper die assembly that can be controlled in an automatic bending cycle to produce different angles in a single part. Other bends are then made in sequence with the tubing held stationary for each position. The operation can be performed with or without a mandrel according to the particular tubing requirements. Because the wiper die and mandrel assembly move with the material as it is bent, die marks and wrinkles are avoided. According to the company, the ram, mandrel and wiping die cylinders operate at 1000 psi while the die clamping system requires 2000 psi.

Circle 10E on reply card

Chromelloy, a product of U. S. Metallurgical Labs, Division of General Power Services, is a steel-hardening compound that works from the surface inward by a carburizing, nitriding and alloying effect, often producing an increased tensile strength. Parts are heated in a forge or flame, dipped in the powder, reheated for approximately 2 minutes and quenched. The entire operation takes about 5 minutes. Production and maintenance tools and parts can be made of mild steel and then hardened by this method. Reportedly, they will last several times longer than those made of tool steel and hardened in the ordinary way. The substance is intended for use on taps and dies, punches, reamers, drills, fasteners, gears, jigs, gauges, chisels, washers, hammers and the like. Because the compound contains no cyanide and emits no toxic fumes, expensive heat treating and ventilating equipment is unnecessary. It is packaged in moisture-proof metal cans or drums and keeps indefinitely.

Circle 11E on reply card

Balanced, heavy-duty construction that provides easy handling has been combined with extra-large floor maintenance capacity in model PR-22 Master Floor Machine, introduced by Premier

Aftercooler and Cyclone Separator designed for cleaner, dryer compressed air

R. P. ADAMS CO., INC.
209 East Park Drive, Buffalo 17, New York

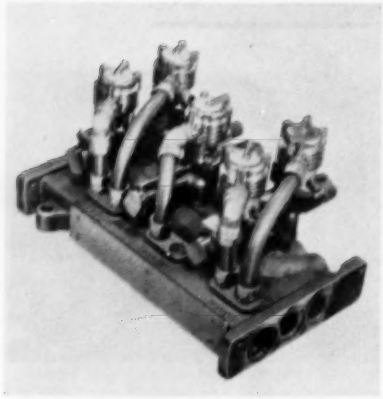
The Adams Aftercooler and Cyclone Separator are designed to efficiently condense and remove water from compressed air and process gas. Condensed moisture and entrained dirt and oil are subsequently removed in a cyclone type separator. This unit is scientifically designed for maximum removal efficiency over a wide range of flow rates.

For normal use, units are available to cool gases to within 10° F of the temperature of the cooling water. Specially designed units are available to permit a 2° F approach to cooling water temperature, for application where low moisture content is critical.

Adams Aftercoolers and Separators are available from stock to handle 20 - 40,000 cfm with 10° cooling and 25 - 19,200 cfm where it is necessary to cool within 2° F of the cooling water. Special units can be supplied to suit an unlimited range of requirements. In all cases, a pressure drop of ½ psi is assumed at a maximum working pressure of 150 psi.

This wide range of sizes enables the cost-cutting application of Adams Aftercoolers and Separators in virtually all industrial application. For further information on how R. P. Adams' units will solve your compressed air problems and save you money, write today for Bulletin 711.

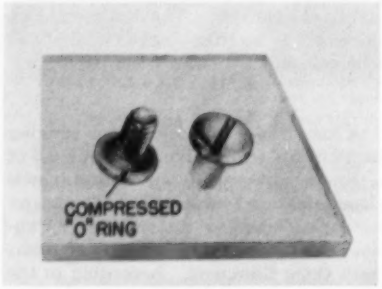
Circle 17A on reply card



Valvair Corporation. Available in 2- and 3-station types, the cast aluminum unit has full-length 1-inch inlet and exhaust ports. Electrical wiring is run through a 1¼-inch National Pipe Thread conduit passage, with one access cover for all stations, thus simplifying wiring. Pilot solenoid leads are enclosed in dirt- and moisture-proof flexible conduit. They are designed with side- or bottom-cylinder porting to facilitate piping, and holes for mounting the manifold and valve assembly are provided. According to the manufacturer, the device can be adapted to any control-valve application with any combination of valves. Use of the fixture is said to reduce piping time and material costs and improve the appearance of complex systems. Further, it permits the use of cost-reducing, centralized-lubricators and filters in the air-supply system.

Circle 5E on reply card

Increased commercial demand for high-pressure sealing devices, originally designed for military uses, has caused Automatic & Precision Manufacturing Company to expand its line to include Seelskrews for general industrial applications. They are standard machine screws with an O ring pressed into a groove under the head. Tightening compresses the ring to achieve vibration resistance and high-pressure sealing. After the installation has been completed, its appearance is identical with that of a conventional screw. The devices maintain their seal even after frequent removals. Reportedly, the basic material used in the O ring offers excellent resistance to petroleum and petrochemical products. Weathering, salt water or exposure to sunlight will not impair effectiveness, even at elevated temperatures. Seelskrews are recommended for applications in the marine, air conditioning and refrigeration, food and chemical, portable tool and home appliance fields.



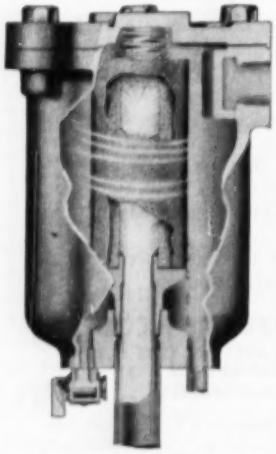
Circle 6E on reply card

Brooke Engineering Company, Inc., has improved its line of smoke indicators and indicator-recorders. The former are designed for either flush or surface mounting. They are equipped with red and green warning lights that indicate when boiler smoke is "out of bounds," and a 4½-inch meter that shows the color of flue gas at all times. Smoke density is transmitted from a photoelectric cell mounted at the boiler outlet to the meter without any time delay. However, according to the manufacturer, an audible alarm that sounds a few seconds after the light comes on can be provided. To prevent its actuation during occasional puffs of smoke, a hermetically sealed time-delay contact is provided. Indicator-recorders are of two types: one records the length of time the smoke has exceeded a set density and the other, the continuous degree of density from clear to black.

Circle 7E on reply card

ADAMS PORO-STONE AIR FILTER

designed to remove oil, water and foreign matter from compressed air lines with minimum pressure drop.



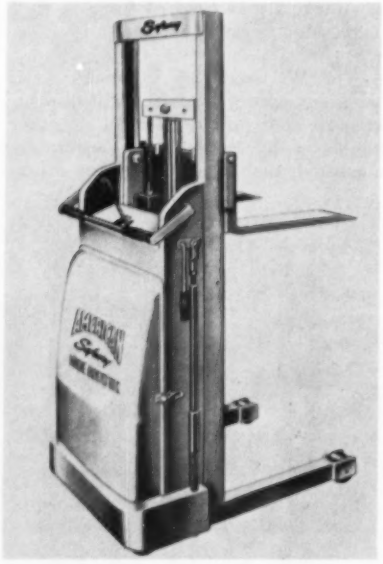
The R. P. Adams Poro-Stone air filter is engineered to efficiently remove entrained oil, water and pipe scale from compressed air lines. Liquid droplets and solids being carried by the gas stream are first removed by centrifugal action in an annular chamber. Secondary filtration is achieved by passing the air or gas stream through a Poro-stone unit. An automatic trap can be provided to discharge the residue from the cyclone chamber.

At rated capacity the filters operate at a maximum pressure drop of only ½ lb., thus insuring delivery of line pressure to the point of consumption.

The units require virtually no service or maintenance — thereby insuring continued trouble-free, low cost performance.

ADAMS Poro-Stone air filters are available from stock in sizes to suit your needs. For further information, write today for Bulletin 117, R. P. Adams Co., Inc., 209 East Park Drive, Buffalo 17, New York.

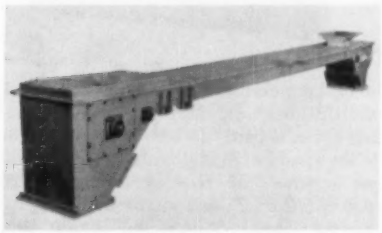
Circle A16 on reply card



The American Pulley Company has redesigned its line of portable elevating trucks as a result of a survey among users and distributers of materials-handling equipment and conclusions drawn from field tests on prototype models. Maximum-load capacity ranges from 1000 pounds for the pedal-operated mod-

pany. The instrument contains a precision, glass etched reticle calibrated for measurements to 0.1 inch by 0.001-inch divisions and, reportedly, estimates to 0.0005 inch can easily be made. A chrome reflector at the base of the device reflects light on the object being examined or measured. Sturdy construction assures long, useful service.

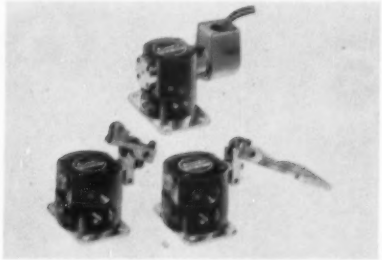
Circle 14E on reply card



For conveying material with a minimum of frictional resistance over horizontal distances up to 300 feet, Sprout, Waldron & Company, Inc., has developed a Slider Board belt conveyor. The unit consists of an endless belt operating over a smooth sheet-metal trough enclosed between head and foot pulley terminals. Skirt plates extend the full length to confine the material being moved and to provide the necessary depth for desired capacities. Belt construction can be of any material required to suit particular applications and the trough can be covered in applications requiring weather-tight housing. Driven by an 1800-rpm motor, the unit has low power requirements and can be adapted to travel up or down inclines or in reverse. Although it is unsuited for material with large lumps in it, according to the manufacturer it is particularly valuable in moving fragile material.

Circle 15E on reply card

Three 4-way valves have been added to A. K. Allen Company's line of ¼-, ⅜- and ½-inch models. The units are available in single-solenoid or foot- or cam-operated varieties, for pressures



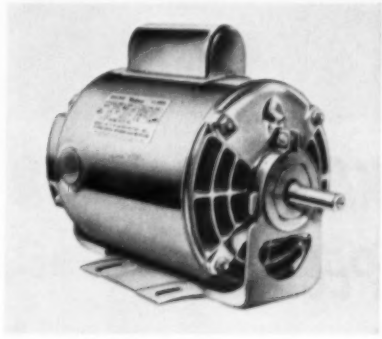
from 5 to 150 psi. Two speed controls are built in to provide what is said to be full control of the cylinder piston in both directions. All friction surfaces are hardened and permanently coated with a baked-on lubricant.

Circle 16E on reply card

Royal Flush 306F, a coolant manufactured by Folden Chemical, Ltd., is said to increase cutting tool service life. It is especially designed for equipment used in machining the harder stainless steel alloys. Utilizing the electro-magnetic (static) attraction caused by tool-part friction, the coolant catalytically prevents pick-up on cutters. Both the tool and parts being machined remain cool enough to touch. No film is left on the parts and reportedly no rust will form. Of neutral composition, the coolant eliminates the problems of paint stripping, spotting and gumming in machines, collets and die heads. It does not turn rancid and is non-toxic.

Circle 17E on reply card

Wagner Electric Corporation is now producing capacitor-start and split-phase motors in both rigid- and resilient-base models. Built to meet NEMA 48 frame size standards, these units are easy to handle, stock and install because



lightweight steel frames and cast aluminum endplates are used. Bearings, lined with "high-tin" babbitt, have anti-seizure, non-scoring and corrosion resistant characteristics. Use of DuPont's Mylar-paper laminated slot insulation, the manufacturer claims, gives the motors moisture resistance, dielectric strength and thermal stability that will extend service life. Motors are available in ⅙, ¼- and ⅓-hp ratings.

Circle 18E on reply card

Series 8000 Wheelco Electronic Multipoint Recorders that can be used to record permanently up to sixteen points on one easy-to-read chart are reportedly simple to operate and service. Based on the null-balance principle, measurements may be obtained with thermocouples, radiation detectors and similar sensing devices where measured variables can be resolved into electrical signals. As many as six limit switches may be incorporated to provide high- and/or low-signal indications; as many as four may have a common front set; and according to Barber-Colman Company, the manufacturer, additional switches are independently adjustable. Housed in a dust- and moisture-proof steel case, the unit

Fulflo Filters keep your air lines clean — minimize troublesome gumming. You make substantial savings in longer equipment life, trouble-free operation, low-cost maintenance and maximum protection of air-operated tools and instruments.

Inexpensive, compact units can be installed at every point of use. Multiple tube filters are available for high flow rates or central installations. Special models can be engineered for flow rates up to 14,000 scfm or pressures as high as 5000 psi. All Fulflo Filters employ genuine Honeycomb Filter Tubes to provide true *depth* filtration.

Commercial Filters Engineers are ready to help you with any problems involving micro-fine filtration of compressed air, carbon dioxide and other gases. Write for technical literature to Department CA.

Plants in Melrose, Massachusetts and Lebanon, Indiana

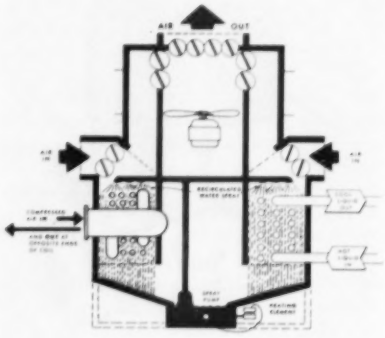
Circle 19A on reply card

Company. Engineered for rugged duty in industrial plants, packing houses, warehouses and other areas involving floors of 20,000 square feet and more, the machine scrubs, shampoos, waxes, polishes, grinds, sands, buffs or dry-cleans. It is designed for use on all types of surfacing, including carpeting. Powered by a 1-hp, constant-speed electric motor, the unit has permanently sealed ball bearings that require no lubrication. An adjustable handle reduces operation effort and the speed of its 22-inch brush is preset for maximum efficiency and non-splatter scrubbing. Measuring only 12 inches from the floor to its motor-housing top, the equipment reportedly provides access to hard-to-reach areas. A forty-foot length of electric cable is furnished.

Circle 12E on reply card

A new design of Niagara Blower Company's Aero After Cooler is intended to replace shell-and-tube models and cooling towers and operates independently of a large cooling water supply. The device has provisions not only for cooling compressed air but also the coolant used in closed compressor-jacket and intercooler systems. The apparatus has two cooling coils—one for water, the other for air. Each is mounted in a separate casing but the two are joined to a central plenum chamber. Water is continuously sprayed over the coils and a portion of it is evaporated by an air stream pulled through the cooling casings by a fan mounted above the chamber. Air enters above the coils, passes down through them and is deflected into

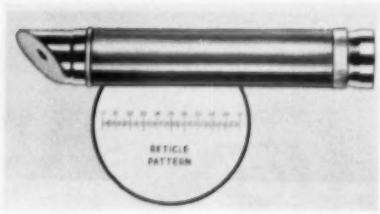
FLOW DIAGRAM



the plenum where entrained moisture is precipitated. The latter is drained to a cold well and recirculated over the coils. The device is rated at an effective heat transfer of 1000 Btu per pound of water evaporated. Air is thus cooled to a point near the wet-bulb temperature (hence below the dry-bulb mark) and no further condensation takes place in exposed piping. Intercooler and jacket water temperatures are controlled by regulating air intake dampers to adjust the aftercooler capacity to outdoor conditions. Steam or electric heaters for the spray water can be provided to prevent freezing in the winter.

Four sizes are available with capacities to 23,000 cubic feet of free air per minute cooled from 275° to 85°F. Reportedly a 95-percent saving of cooling water is possible and expensive moisture damage to pneumatic systems and tools is eliminated. The equipment assures dry air for the operation of automatic machines, paint-spraying and sand-blasting equipment as well as in power applications and such special processes as air-liquefaction systems.

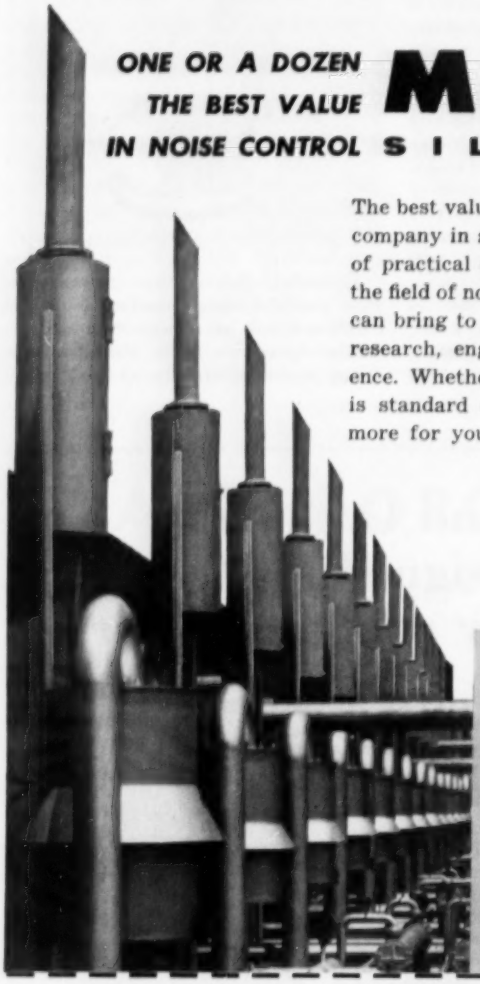
Circle 13E on reply card



No larger than an ordinary fountain pen, a pocket instrument that is suitable for making direct-reading measurements and checking small parts and dimensions under powerful magnification is announced by Edmund Scientific Com-

ONE OR A DOZEN
THE BEST VALUE
IN NOISE CONTROL

MAXIM
SILENCERS



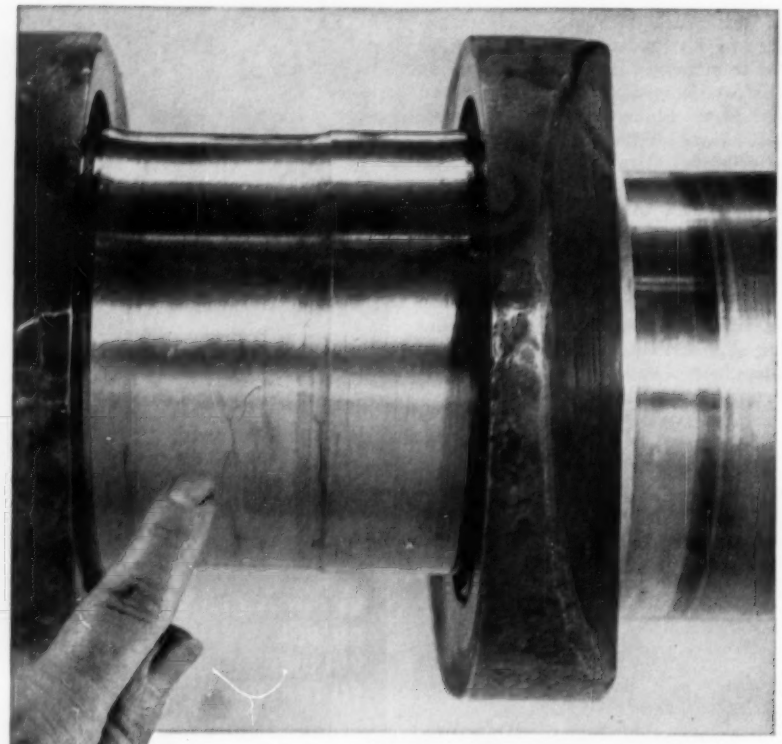
The best value because Maxim, the pioneer company in silencing, can point to a store of practical experience second to none in the field of noise control . . . because Maxim can bring to your problems more years of research, engineering and design experience. Whether your silencing application is standard or "special", Maxim can do more for you.

SILENCERS FOR:

- INTERNAL COMBUSTION AND STEAM ENGINE EXHAUST AND INTAKE
- AIR COMPRESSOR INTAKES AND DISCHARGES
- VACUUM PUMP DISCHARGES
- BLOWER INTAKES AND DISCHARGES
- STEAM, AIR OR GAS DISCHARGES
- JET ENGINE EXHAUST AND INTAKE
- WASTE HEAT RECOVERY

THE MAXIM SILENCER COMPANY
Subsidiary of Emhart Manufacturing Company
61 Homestead Ave., Hartford, Conn.
Gentlemen: Please send bulletins on silencers for:
.....
NAME .....
COMPANY .....
ADDRESS .....

Circle 18A on reply card

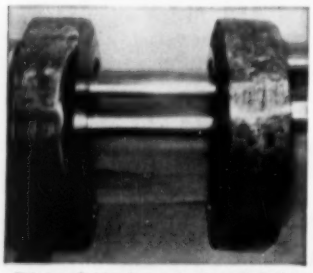


THIS CRANKSHAFT JOB NEEDS A SPECIALIST

This is specialized work, rebuilding crankshafts—intricate, exacting, and naturally expensive. It's the kind of work that demands a specialist . . . and we are just that!

We've specialized in rebuilding crankshafts, because since 1916 we've *made* crankshafts. And who knows better than a maker what are the "musts" of a sound, economical repair job. We'll take your worn crankshaft and rebuild it, if salvagable, through the carefully controlled steps of grit blasting, replating, regrinding and thorough inspection. And we'll deliver it back with a guarantee for 100% performance that only a manufacturer-specialist can provide. May we quote on your next job?

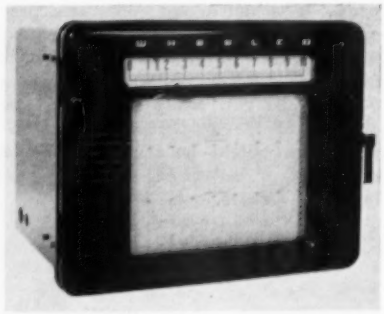
For more details on crankshaft repair write for Bulletin RC-4



This is a finished, repaired crankshaft, after processing by National Forge.

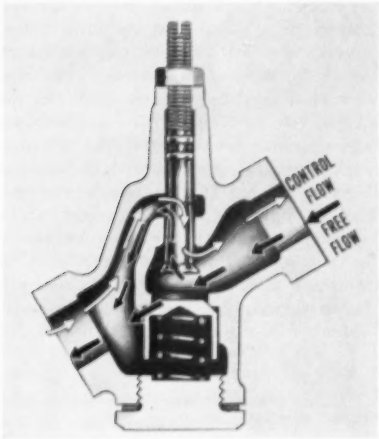
NATIONAL FORGE
AND ORDNANCE COMPANY
Irvine (Warren County), Pa.

Circle 20A on reply card

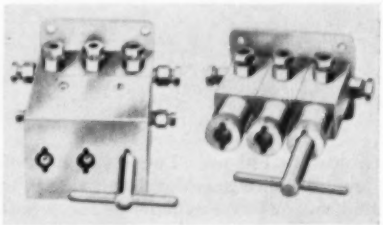


may be purchased for either single or multicolor print, with a 5-second printing cycle, sensitivity of 5 microvolts (for scale spans of 5 millivolts or less) and an accuracy of plus or minus 0.0025 percent for all scale spans in the pyrometric range. Additional details and specifications are available from Wheelco Instruments Division's Bulletin No. F-7955. *Circle 19E on reply card*

Ross Operating Valve Company is offering speed control valves with screwdriver slots that can be mounted in any position on either, or both ends of a cyl-



inder and can be disassembled easily without breaking air-line connections. The design of the unit is said to allow easy regular-knob or pin-lever adjustment and provide precision timing of piston movement by positive control of air flow. *Circle 20E on reply card*



Two models of manifold valves for pneumatic installations are available from Petrometer Corporation. Both

feature fool-proof operation and quick, air-tight action without the necessity of turning and tightening handwheels. They are reportedly suitable for pneumatic instrument and control installations as well as other pneumatic systems.

Model 1583 consists of a 2-position piston sliding in a 2-port cylinder that is normally closed. The valve is opened by inserting a key and giving it a 90-degree turn. When the key is withdrawn, the valve closes automatically under spring tension.

Model 1563 is a duplex type that consists of two mechanically linked, 2-port, 2-position piston-type valves. They are normally held closed by spring tension, but, again when a key is inserted and turned 90 degrees, both valves are simultaneously opened. They close automatically upon withdrawal of the key.

Circle 21E on reply card

A complete 9x15½x4-inch, heavy-gauge steel unit that simplifies the cleaning of protective eyewear lenses has been

developed by United States Safety Service Company. A plunger-type, 8-inch spray bottle that provides anti-fogging cleaning fluid is set in one end. Single, 5x9-inch optical tissues are dispensed from two separate positions and a receptacle for used ones is provided. A keylock opens the front for servicing and

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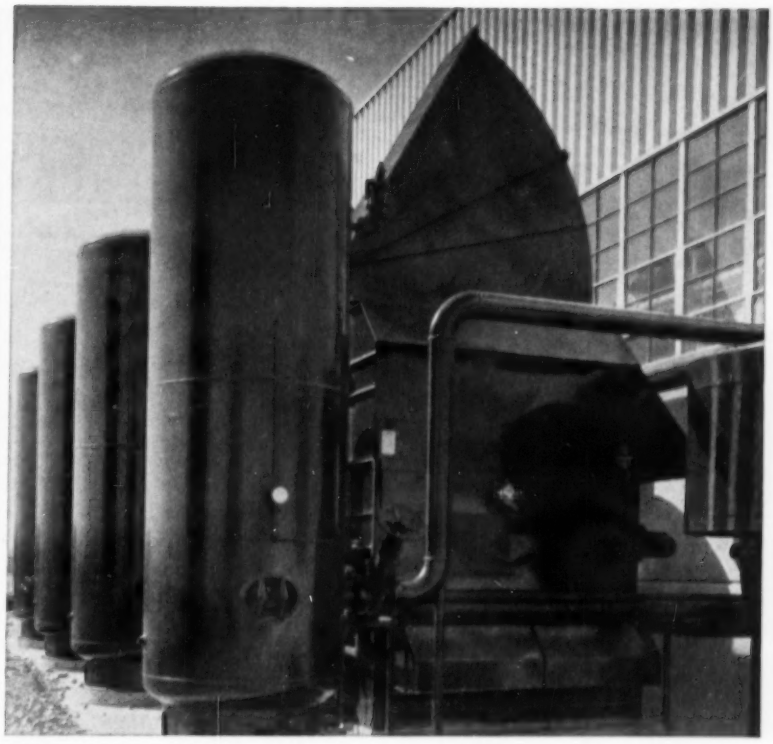
TWO PEACHES AND ORANGE

Methyl borate is being used in the agricultural industry as a preservative of citrus fruit during shipment because it prevents mold from forming on bruised fruit. The chemical is produced by American Potash & Chemical Corporation from deposits at Trona, Calif. The picture shows Frank Radovich of that firm demonstrating how the fungicide is sprayed from a pressure dispenser into containers of fruit. Looking on are Delphine Mohrline, left, and Evelyn Hort.



HOW YOU SAVE,

Getting Drier Compressed Air

● Direct saving in the cost of cooling water saves the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, the drier air gives you a better operation and lower costs in the use of all air-operated tools and machines, paint spraying, sand blasting or moisture-free air cleaning. Water saving also means less expense for piping, pumping, water treatment and water disposal, or you get the use of water elsewhere in your plant where it may be badly needed.

Niagara Aero After Cooler assures all these benefits because it cools compressed air or gas below the temperature of the surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air thru a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter by the Niagara Balanced Wet Bulb Control.

Write for complete information; ask for Bulletin No. 130

NIAGARA BLOWER COMPANY

Dept. CA-4, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

Circle 21A on reply card

MORE GALLONS

If your liquid moving problem is primarily a matter of pumping efficiency . . . more gallons per kilowatt hour . . . then you should get the facts about Ingersoll-Rand's line of Motorpumps.

Its high efficiency results from a well-designed and expertly finished impeller and casing . . . carefully selected for each job from the most extensive line available . . . a good stuffing box or mechanical seal . . . and the best brand name motors.

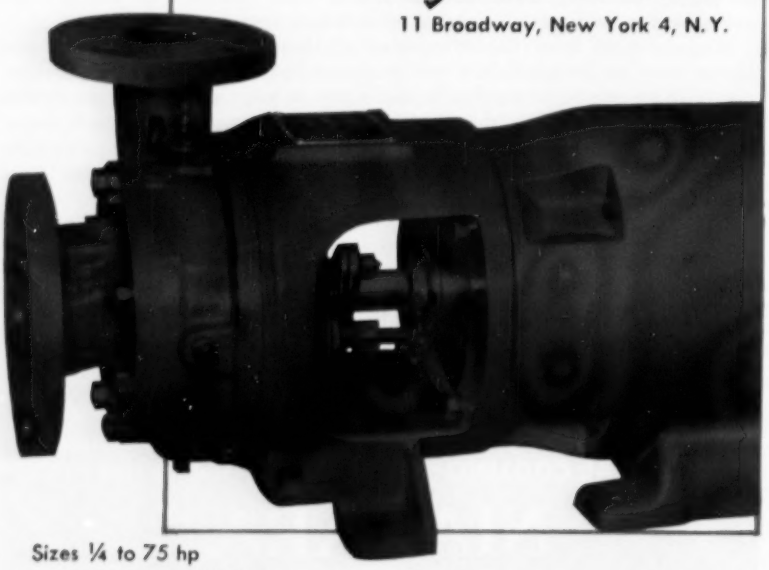
In addition, the powerful Motorpump is built for long life, low maintenance and operating dependability. Get complete information by contacting the local Ingersoll-Rand branch office or write for a complete bulletin.

MOTORPUMP

by

Ingersoll-Rand

11 Broadway, New York 4, N.Y.



Sizes ¼ to 75 hp
—capacities to 2800 gpm
—heads to 650 feet

9-591

Circle 22A on reply card

screws are included to attach the box to the wall. Refills are available in pints and gallons, and tissues (240 per box) may be purchased in 72-individual-box lots. *Circle 22E on reply card*

For industries where water scarcity is a problem or surplus water disposal is costly, Lundholm Manufacturing Company has developed lightweight steel and aluminum cooling towers with 2- to 25-

ton capacities. Reportedly, one of the units will reduce water consumption by about 90 percent. Because it is compact —the 2-ton model is only 34½x27x41 inches—indoor installation using a simple, on-the-floor or ceiling-suspension method is possible thus providing year-round operation without cold-weather freezing. The device is designed specifically for use with water-cooled Lundholm Liquid Coolant Chillers for hydraulic oils and similar fluids. In locations where the chillers are utilized, production men report longer tool service life, increased production and closer tolerances during milling, grinding and other heat-producing processes.

Circle 23E on reply card

"I did save my money when I was young but my wife spent it."

BRIEFS

Engineers at the Hanford Atomic Works have borrowed a medical instrument, called a cystoscope and usually used for visual examination of the human bladder and other organs, to inspect hard-to-see areas. The device is fitted with a light bulb of about the size of a grain of wheat and is equipped with a system of mirrors that permits the inspector to see in any direction. It has a magnifying glass on the eye-piece and pictures can be taken through it. The "sneaky-peeky," as it is called, has been used for double-checking connections, inspecting fuel elements, examining reactor apertures and other similar tasks.

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The American Gas Association estimates a net income in the gas utility and pipeline industry of more than a billion dollars a year by 1965, a 63-percent increase over last year's estimated $630 million and a 5-fold gain over the 1946 mark.

•

One more passenger can be carried in Douglas Aircraft's new DC-7 Superliners, it is reported, because titanium was used in nacelles instead of other metals. No change in design was required and total take-off weight remains the same.

Tires placed in a steel mold and rotated slowly over radioactive fuel can be vulcanized, according to the B. F. Goodrich Company. This atomic method eliminates the need of chemicals and heat. Although the process has been tested successfully at the Atomic Energy Commission's national reactor testing station in Idaho, it will be some time before it can be adapted to the rubber-tire industry.

•

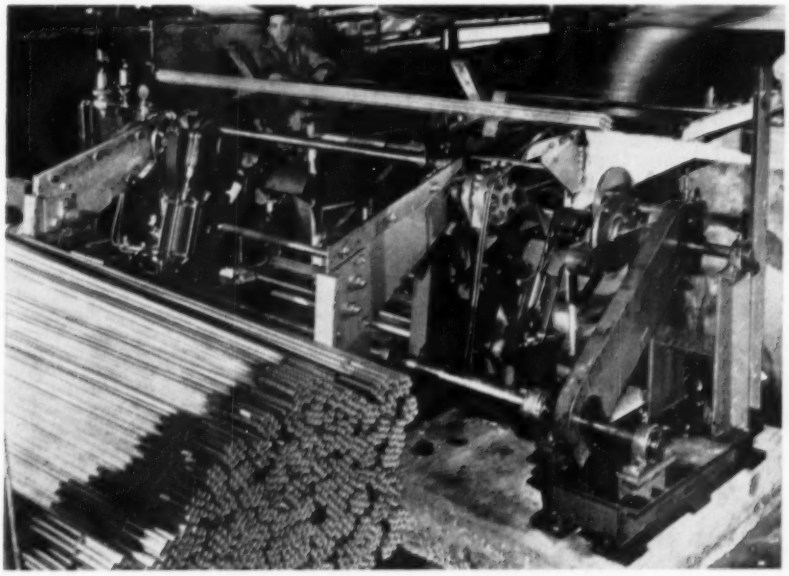
The Los Angeles Air Pollution Control District has estimated that nearly 65 million cigarettes smoked daily in Los Angeles County yield 9.267 tons of particulates, plus aldehydes, organic acids, hydrocarbons and carbon monoxide that bring the total of contaminants added to the air to almost 12 tons.

•

The U. S. Patent Office, now in its 168th year, issued about 47,000 patents for mechanical, chemical and electrical inventions; 3000 for designs; and 100 for plants during 1956.

•

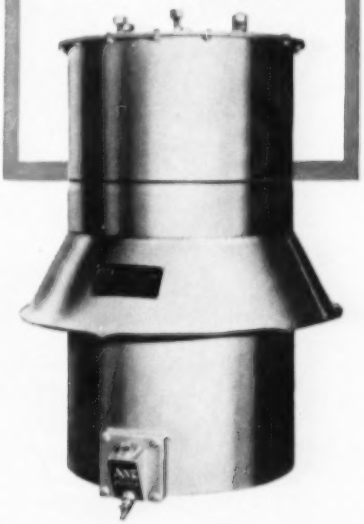
A remarkable safety record of half a million man-hours worked without a lost-time accident has been compiled by the mine and mill of United States Gypsum Company at Heath, Mont.



AIR AIDS IN BUNDLING CONDUIT

Three bundles of electrical metallic tubing can be bound every minute with a machine that is in use at the Etna, Pa., plant of Spang-Chalfant Division of The National Supply Company. After inspection and labeling, conduit moves by gravity into a V-shaped, cradle-type bundler. When the desired number of pieces have dropped, the operator presses a button to activate a manipulator, shaped to the desired bottom conformation, that shakes down the tubing. Air-operated clamps lower and hold the bundle while pressure-sensitive tape is applied three times around each end by a rotating head. A knife cuts the tape, a roller seals its loose end and the cycle concludes as the finished bundle is ejected. The number of pieces per bundle varies from three to ten, depending on the diameter of the conduit. Groups taped are said to be firmer, more quickly wrapped and handled easier than those tied by hand with twine.

AAF
Cycoil
Oil Bath
Air Cleaners
Give
Positive
Protection



AAF Type "W" Cycoils have proved themselves in thousands of installations—even where dust conditions were most severe. High collection efficiency and virtually maintenance-free operation have made Type "W" Cycoils favorites in all industries.

The operation of the Cycoil is unique. A combination of oil impingement, centrifugal action, and filtration results in practically 100% dust removal in standard A.S.H.V.E. tests.

Would you like more information? Write for our illustrated catalog.

AAF

American Air Filter

COMPANY, INC.

402 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q.

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MORE THAN 100 BASIC ENGINES, BUILT TO 2,000 DIFFERENT SPECIFICATIONS,

EQUIP CONTINENTAL WITH POWER PLANTS TAILORED TO THE NEEDS OF CONSTRUCTION MACHINERY OF PRACTICALLY ALL SIZES AND TYPES

Continental Red Seals for specialized applications are available at closely-spaced power levels, in liquid-cooled and air-cooled models, for use on all standard fuels. And, strictly on the score of performance, economy and dependability, they are finding their way into more and more leading makes of road building and construction equipment for every operation from excavation on through final grading. Every Continental Red Seal is not only built for its job, but backed by parts and service facilities from coast to coast.

A COMPLETE LINE OF SMALL AIR-COOLED ENGINES

In addition to its large engines, Continental builds an outstanding line of heavy-duty air-cooled four-cycle models for industrial applications requiring 2 to 4 h.p. Advanced engineering gives them easy starting, high dependability, and unusual lugging capacity at low speeds. For information, address Air-Cooled Industrial Engine Division, 12800 Kercheval Avenue, Detroit 15, Michigan.

CONTINENTAL MOTORS — Powerful as the Nation — AMERICA'S STANDARD

Continental Motors Corporation

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6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Circle 24A on reply card

Industrial Books and Literature

Mechanical Engineering Laboratory, a volume by Jesse Seymour Doolittle, professor of mechanical engineering, North Carolina State College, is reportedly the first to differentiate between the problems of designing and constructing laboratory test equipment and the proper use of the tools after they are made. According to Prof. Doolittle, the study of instrumentation for testing equipment is a field separate from that of the actual use of the equipment and he has divided his work into three parts to cover both fields adequately. Part I treats instrumentation, Part II is concerned with the determination of specific properties of fuels and lubricants and Part III deals with engineering experimentation. Some emphasis is given to the meeting of testing codes of various engineering societies and a section on preparing engineering reports is also included. The book was written primarily for first-course classes in a mechanical engineering laboratory and to give the necessary background for advanced courses in the field. In addition, it is said to be of value to the graduate engineer and others in industry that are called upon to make tests of a mechanical engineering nature. It is available from the publisher, McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. Price, $6.50.

The Eastern Machine Screw Corporation, 140 Truman Street, New Haven 6, Conn., has published another issue of *Die Headlines* (Vol. IV, No. 6) for personnel responsible for thread designing, production, gauging and inspection. The publication deals with standards covering the Unified and American National screw threads. It presents the major, minor and pitch diameters giving the classes, allowances and tolerances of all internal and external threads up to and including 2 inches. Data given are in advance of those to be published by the American Standards Association. Copies cost 25 cents unless requests are made on company letterhead, in which case, they are free of charge.

Engineering Bulletin LFC, about liquid filters of special metal-screen disk construction, is published by Air-Maze Corporation. Complete data for designers and users of equipment requiring full flow filtration of lubricating, hydraulic or fuel oils are given. Precisely controlled openings reportedly assure positive filtration for any selected degree of separation and sizes of the units range in capacity from 1.7 to 720 gallons per minute. Models are available for high- or low-pressure systems, with or without built-in relief valves.

Circle 24E on reply card

To eliminate confusion in the handling, storing and using of pipe nipples, Pittsburgh Nipple Works, Inc., has devised a system of identifying them according to the type of material used, ASTM specifications, weight and grade by means of roll indented markings and color tints. Catalogue No. 756 describes the program in detail.

Circle 25E on reply card

Punch-Lok Company's Catalogue No. 300 is not only a compilation of its standard-type hose clamps, grooved fittings, special tools and replacement parts, but also an instruction and training manual as well. Separate sections are devoted to methods, uses and applications.

Circle 26E on reply card

Rapistan Press-Veyor, Jr., and magnetic Press-Veyor belt conveyors, designed to move stampings or scrap from press to tote bin are described in two 2-page product bulletins (Forms LPV-56 and MPV-56) issued by The Rapids-Standard Company, Inc. The first is a cleated-belt model for light-duty pressroom production and the second, particularly useful in crowded areas, uses a magnetic field to keep stampings or scrap on its steeply inclined belt.

Circle 27E on reply card

Better Testing and Small Scale Reduction (Brochure No. 157) describes crushers used to reclaim fused welding flux for reuse, for crushing laboratory samples, making pilot runs and regular material reduction. The equipment described has capacities ranging from 600 to 2000 pounds per hour and is produced by American Pulverizer Company.

Circle 28E on reply card

Engineering Data Sheet No. 53, which discusses the characteristics and applications of a metallizing powder called C-250 is available from Wall Colmonoy Corporation. Included is a detailed, recommended 11-step procedure for applying the substance, which is claimed to produce superior crankshaft bearing surfaces.

Circle 29E on reply card

Construction, design and operation of power roof ventilators available from American Blower Corporation are described in an 8-page booklet (No. 3904). Installation drawings, certified ratings and performance data for each model are given.

Circle 30E on reply card

A flyer released by Jerpbak-Bayless Company illustrates its bench model SK-1003 lead comparator, a device for measuring long, large-diameter threads; inspecting gauges, bolts, taps and screws; and checking spacing of holes, grooves, notches, etc.

Circle 31E on reply card

Float switches, designed to indicate or control liquid oxygen level, are described in Engineering Bulletin No. 1066, published by Revere Corporation of America. For use in a temperature range from −320° to 200°F, these units weigh ¼ pound and are less than 5 inches high.

Circle 32E on reply card

Metering valves for 6000-psi gas or liquid pressure, instrument valves for 3000-psi pressure and dehydrator filters and cartridges for removing droplets of oil and water from gas streams are discussed in Bulletins Nos. 1157 and 12156, published by Robins Aviation.

Circle 33E on reply card

A brochure that describes lightweight high- and low-pressure steel cylinders manufactured by Walter Kidde & Company, Inc., gives specifications of 55 standard containers ranging in capacity from 8.6 to 855 cubic inches and in pressure ratings from 300 to 3000 psi.

Circle 34E on reply card

Arcair Company has a 4-page folder on the use of an Arcair torch for cutting, gouging, beveling or grooving metals. Numerous applications and data on Arcair electrodes are featured.

Circle 35E on reply card

Tube & Hose Fitting Division of Parker Appliance Company has issued a 28-page catalogue (No. 4320) that covers flareless-type Ferulok tube fittings as well as others for mounting in the new SAE straight-thread boss utilizing an O-ring for sealing.

Circle 36E on reply card

GOODALL "ALLSERV"

General Purpose HOSE

"ALLSERV" will not only give long, reliable service on air and pneumatic tools, but will prove equally efficient in the handling of water, oil, gasoline, paint and insecticide spraying, grease guns, etc. The adaptability of this one hose to such a wide variety of applications provides a sure way to keep hose inventory low.

"ALLSERV" is a very flexible all-"Synplastic" Ⓡ molded-and-braided hose, in one, two or three braid construction, with a tough wear-resistant red cover. Made in sizes ¼" to 1½", for working pressures from 200 lbs. to 300 lbs. Available in maximum lengths of 500 feet.

"If it's GOODALL, it MUST be GOOD!"

Contact Our Nearest Branch

Standard of Quality—Since 1870

HOSE • BELTING • FOOTWEAR • CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

Branches and Distributors Throughout the United States and in Canada

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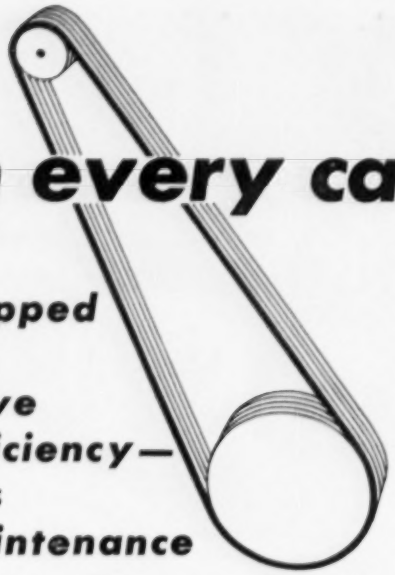

in every case

stepped up drive efficiency— less maintenance

with Wood's complete drives

SHEAVES • V-BELTS • COMPLETE DRIVES • All Sizes • Quick Delivery • Contact Your Nearest WOOD'S Distributor • Write for Bulletin #199.

T. B. WOODS SONS CO.
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Circle 26A on reply card

HOW TO GET BETTER COMPRESSED AIR DRAINAGE!

USE THE RIGHT TYPE TRAP FOR THE JOB!

TYPE OF TRAP	SNAP ACTION (Fig. 1)	REGULAR BALL FLOAT (Fig. 2)	INVERTED BUCKET (Fig. 3)
Handles oil?	Light oil only	No	Very well
Handles dirt?	Moderate	No	Very well
Air loss?	None	None	Small
Requires priming?	No	No	Yes
Float collapse or leakage?	Remote	Remote	Impossible
Gravity drainage to trap required?	Yes	Yes	No

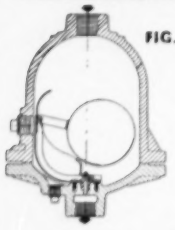

FIG. 1

FIG. 2

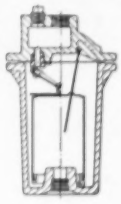

FIG. 3

GET THE FACTS:

FREE AIR TRAP BULLETIN *Send Today*

ARMSTRONG MACHINE WORKS

8852 Maple Street, Three Rivers, Mich.

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GET THE MOST OUT OF YOUR COMPRESSED AIR EQUIPMENT . . . SPECIFY

CONRADER UNLOADER VALVES

New Models . . . Smaller . . . More Compact

Positive operation in any position.

Adjustable differentials.

Operating pressures from 4 p.s.i. to 600 p.s.i.

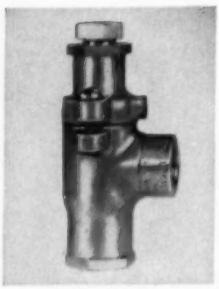
Standard on leading compressors.

Conrader's exchange service trades you a completely rebuilt valve for an old one with new valve guarantee.

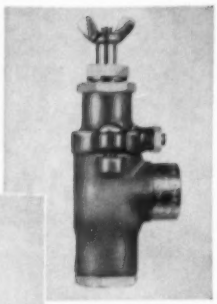
One day service on repairs.

Conrader is equipped to custom design special valves in pressures to 1000 p.s.i.

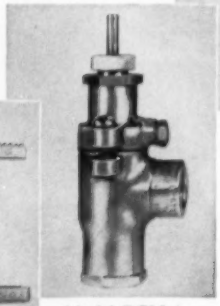
Distributor Franchises Open.



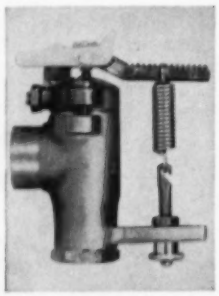
Model RCW



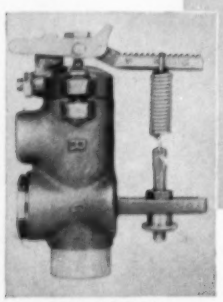
Model RCM-A with hand unloader



Model RCM-A



Model RCF



Model RCS (Available with drain cock)

R. CONRADER CO. INC.

Box 924 ERIE, PA. Since 1925

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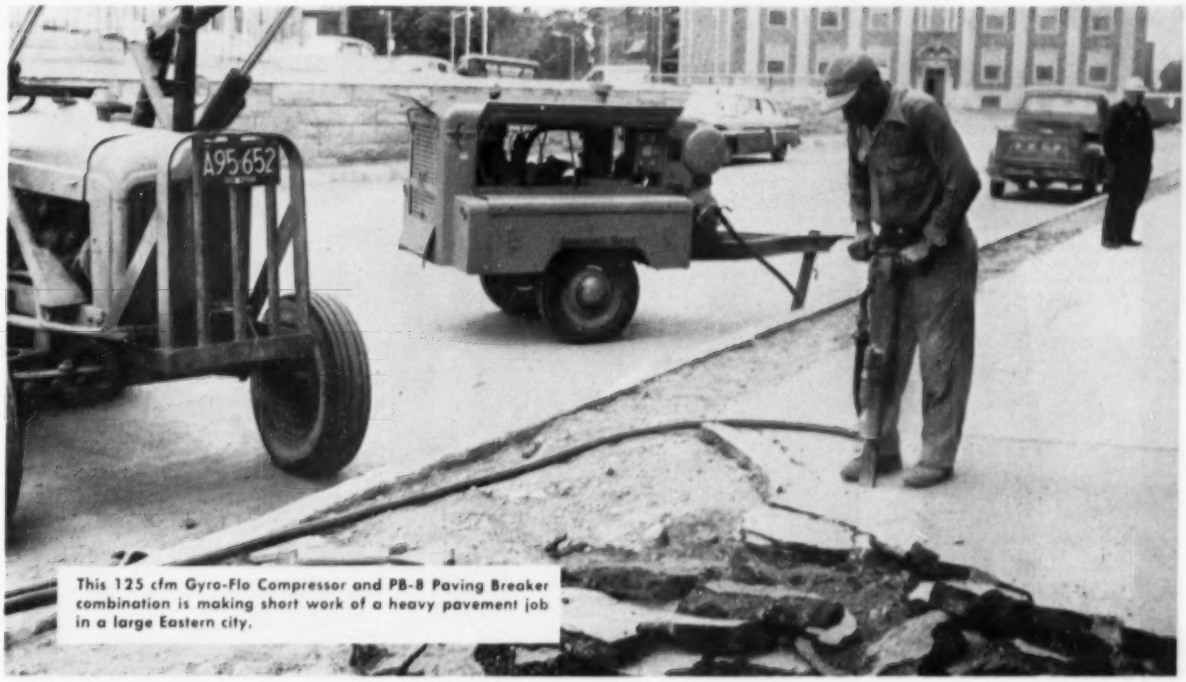


This 125 cfm Gyro-Flo Compressor and PB-8 Paving Breaker combination is making short work of a heavy pavement job in a large Eastern city.

On any pavement job, you can

BREAK IT UP and FINISH IT UP

in record time with this I-R CONTRACTORS' COMBINATION

1 An I-R GYRO-FLO COMPRESSOR of the right capacity

With the complete line of Gyro-Flo rotary compressors, there's no need to haul around or pay for any more air power than you actually need. Now available in 85, 125, 210, 315, 600 and 900 cfm sizes, you can pick a unit with the *right capacity* to operate as many or as few paving breakers as the job calls for. That means no idle compressor capacity – no overloading that cuts tool pressure and slows up the work. What's more, GYRO-FLO's *proved performance* assures a smooth, dependable air supply that's tops in fuel economy and remarkably free from attention or maintenance.

2 I-R PAVING BREAKERS of the right weight and power

Ingersoll-Rand offers you the most complete line of paving breakers and accessories available today. From the big, heavy-duty, 100-lb Breaker and Pile Driver to the lightweight 20-lb Demolition Tool and Digger – you can match the *tool* to the *job*. Use only the weight and power you need – reduce operator fatigue and save air power cost. In addition, I-R paving breaker steels and accessories, designed and built to stand up longer on the toughest jobs, are available for every breaking and demolition application.

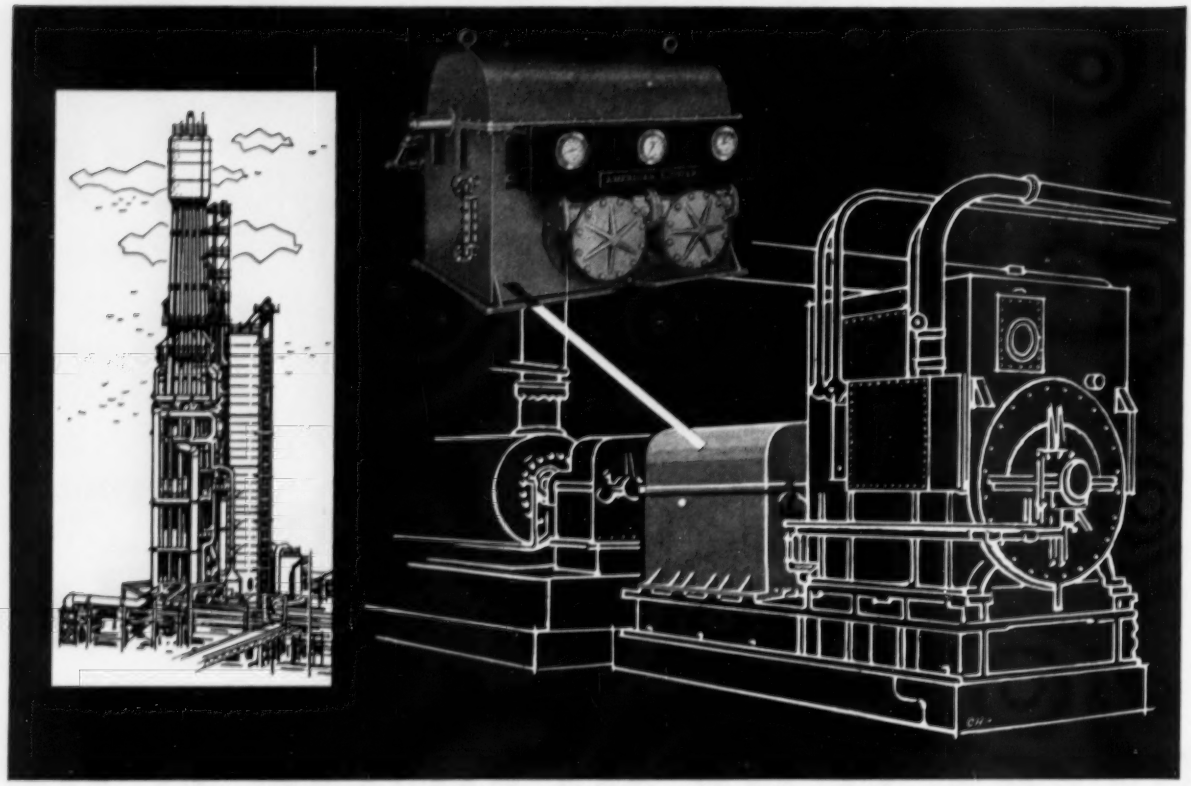
Ask your I-R representative for the complete facts on this time-saving Contractors' Combination.

Ingersoll-Rand 14-502

11 Broadway, New York 4, N.Y.

THE BEST AIR EQUIPMENT FOR BETTER HIGHWAYS

AMERICAN BLOWER *Gýrol*® FLUID DRIVE . . .



Class 4 and Class 6 (shown). Type VS Gýrol Fluid Drives, 100 hp to 12,000 hp, speeds to 3600 rpm.

Here's how accurate pump and compressor control solves varying flow problems at refineries

Problem: how can refineries simplify and control the flow of gases and fluids of various densities and temperatures? Solution: an American Blower Gýrol Fluid Drive that permits smooth, shockless speed and torque adjustments between motor and load!

Catalytic reforming processes – You can vary the flow rates of pumps and compressors of all sizes and types – as needed – with the adjustable-speed feature of the Gýrol Fluid Drive. What's more, the Gýrol unit simplifies starting equipment, even provides no-load starting.

Centrifugal and positive displacement pumps – The combination of a Gýrol Fluid Drive and a constant-speed induction motor provides stepless, adjustable speed for flow control of centrifugal and positive displacement pumps – without throttling valves! You get the same flexibility and adjustable flow as obtained with a steam turbine.

Catalyst rejuvenators – Gýrol Fluid Drives are a big help to this and other refining operations requiring high-inertia starts. The smooth, shockless power transmission satisfies tough drive requirements; lets you engage the load with engine at full rpm, or permits across-the-line starting of normal-torque, general-purpose motors.

Call your American Blower branch office for full information, or write American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ont.

AMERICAN BLOWER

Division of AMERICAN-Standard

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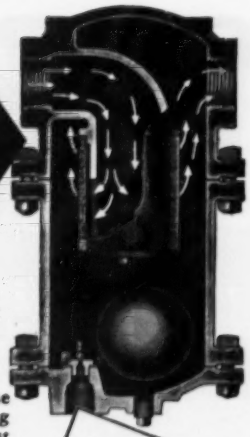
NO MOISTURE OR DIRT GETS BY HERE



Johnson Self-Draining Compressed Air Separator.....

Like all Johnson Separators the new Type "SA" Self-Draining Separator combines the two most effective principles of removing moisture and dirt from compressed air:

1. Controlled expansion of air in separator precipitates most of the moisture.
2. A "thousand baffles" of coarse mesh repeatedly changes flow of direction to capture remaining foreign matter.

Johnson Separation Devices include Separators for Compressed Air or Steam. After coolers, oil absorbers.

Self-Draining—a simple but complete trap mechanism built right in, automatically drains separator whenever necessary.

WRITE FOR CATALOG

The Johnson Corporation

830 WOOD STREET — THREE RIVERS, MICH.

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AMAZINGLY SUPERIOR BEARING BRONZE

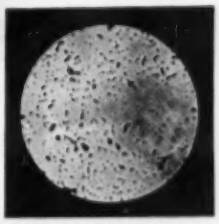
BEARIUM METAL

The unique structure of Bearium Metal combines not only the best features of babbitt and bronze, but, in addition, has desirable frictional characteristics that are exclusive.

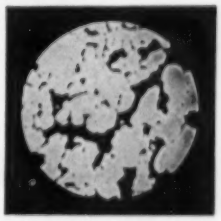
★ It will not melt out like babbitt.

★ It does not score like an ordinary bronze.

★ It definitely puts an end to all problems ordinarily encountered in frictional applications.



BEARIUM METAL magnified 25 diameters shows lead (black) in microscopic, globular form, uniformly distributed.



ORDINARY LEADED BRONZE at 25 diameters shows poor lead distribution, with lead between copper grains.

Write for Full Information on this Amazing Bearing Alloy

BEARIUM METALS CORP.

191 Mill St., Rochester 14, N. Y.

WEST COAST AFFILIATE:
Nevin Engineering Associates
208 Toyopa Drive Box 536
Pacific Palisades, California

IN CANADA:
Bearium Metals of Canada, Ltd.
155 George St.
Toronto 2, Canada

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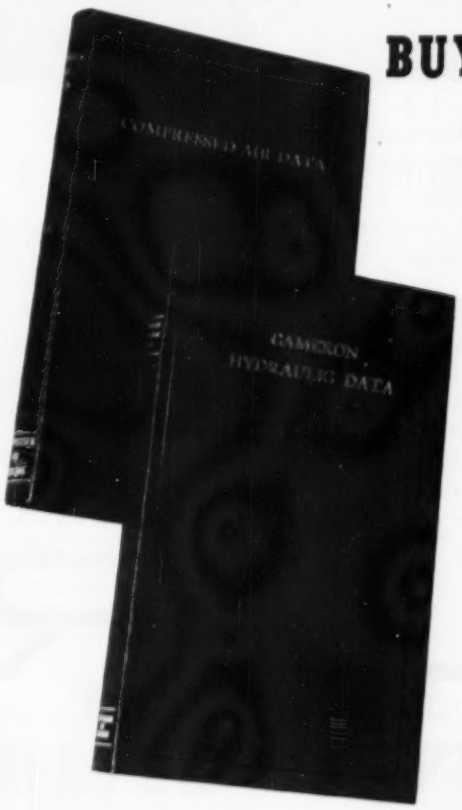

BUY BOTH BOOKS FOR $5.00

COMPRESSED AIR DATA (Fifth Edition): 346 pages on the theory and practice of compressed-air engineering. 12 chapters devoted to terminolgy and definitions; theoretical compression of air; boosters and vacuum pumps; turbo or centrifugal blowers and compressors; tables and data; intake air; aftercooling, intercooling, reheating; cost of compressing air; pumping with air; gas compression; installation of compressors; belting; application and performance; and measurement of air flow. Many illustration and formulae.

CAMERON HYDRAULIC DATA (Twelfth Edition): 240 pages on hydraulics, water data, miscellaneous liquids, steam data, electric data, and miscellaneous data. Hundreds of tables, curves, and formulae. The tables showing friction losses in pipe are believed to be the most complete ever offered in one book. An entirely new set of friction tables based on the Fanning formula is included for liquids of various viscosities in standard steel pipes ranging from 1" to 20". The book is almost a "must" for engineers dealing with such steam- and liquid-handling equipment as pumps, pipe systems, steam condensers, steam turbines, steam-jet ejectors, heat-transfer equipment, and water vapor refrigeration units.

Fill out the coupon and mail it today

COMPRESSED AIR MAGAZINE, 942 Morris Street, Phillipsburg, New Jersey U. S. A.
Please send me:

☐ Compressed Air Data and Cameron Hydraulic Data ..... Both book sfor $5.00

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☐ Enclosed is (money order) (check) for $ .....) ☐ Send books C.O.D. I understand that the books will be sent me postpaid, and that they may be returned within 10 days if not satisfactory.

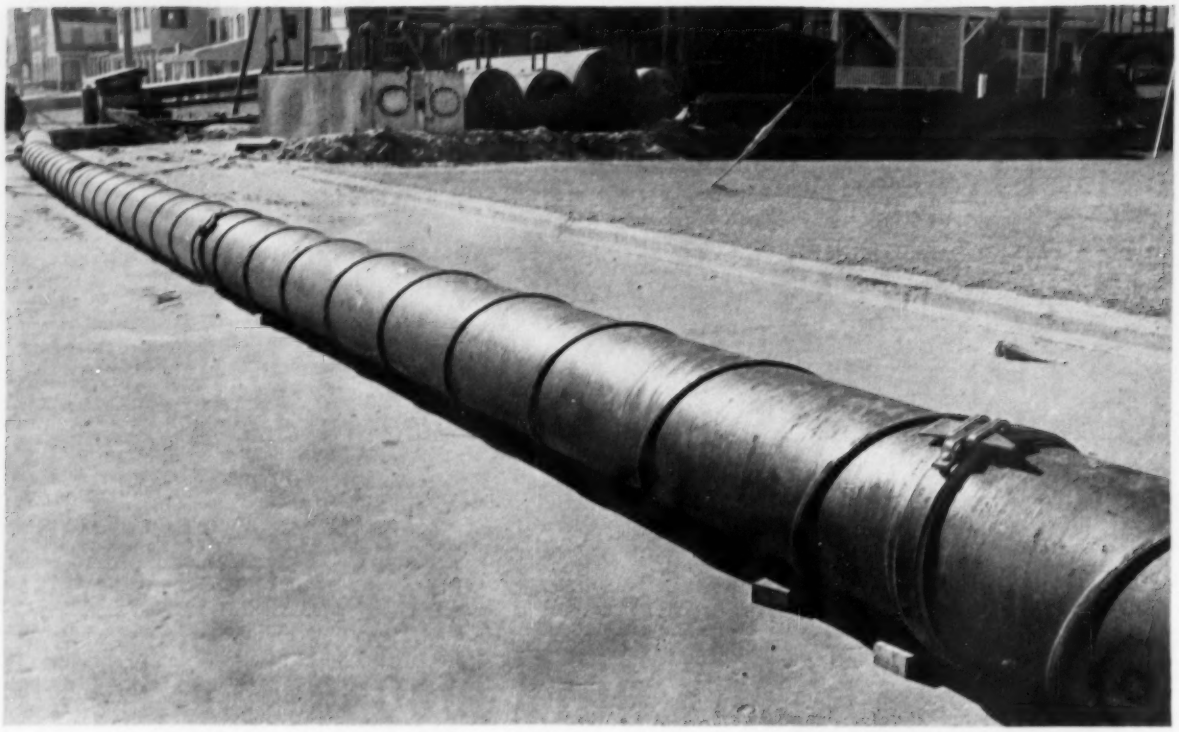
Name .....

Company .....

Street No. .....

City ..... State ..... Country .....

Let NAYLOR PIPE CARRY IT FOR YOU



For carrying air or water on the job, for ventilating in underground construction and for dredging operations you'll save time, work and money by using lightweight Naylor pipe lines.

The familiar spiral that distinguishes this lockseamed - spiralwelded pipe makes it stronger and safer in pipe line performance. The spiral lock gives Naylor pipe greater collapse strength and acts as a continuous expansion joint to absorb shock loads, stresses and strains—characteristics not found in other pipe of the same wall thickness.

Installation is faster and easier with Naylor pipe—especially when joined by the one-piece Naylor Wedgelock coupling, a fast, simple method of positive connection.

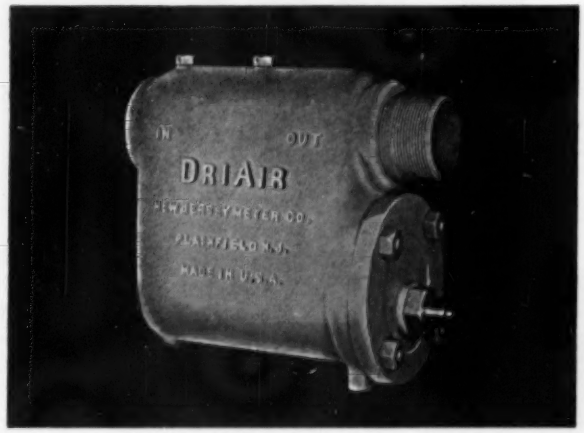
Put this combination to work for you—wherever you need to transport material in volume. Sizes range from 4 to 30 inches in diameter. Write for Bulletins 507 and 513.

NAYLOR

NAYLOR PIPE COMPANY
1245 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office:
60 East 42nd Street, New York 7, N. Y.

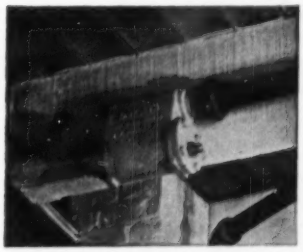
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY

DRIAIR

A COMPLETE SELF-CONTAINED UNIT



DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

Circle 34A on reply card

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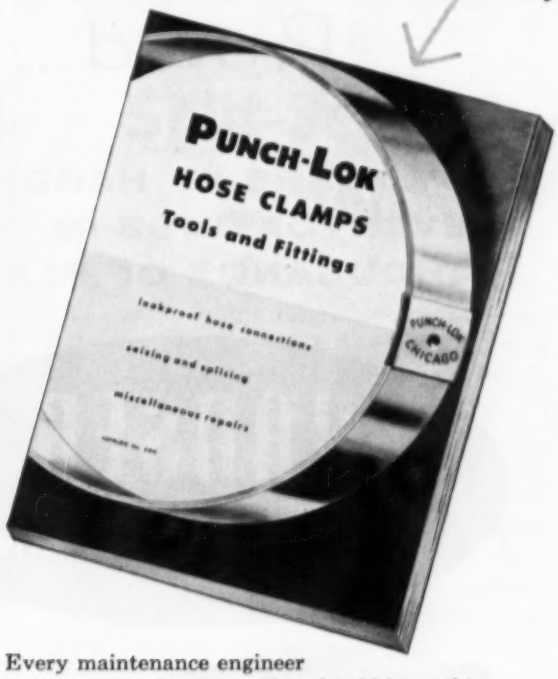
It tells HOW TO SAVE Time and Money



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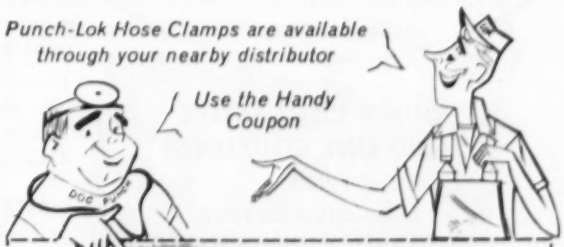

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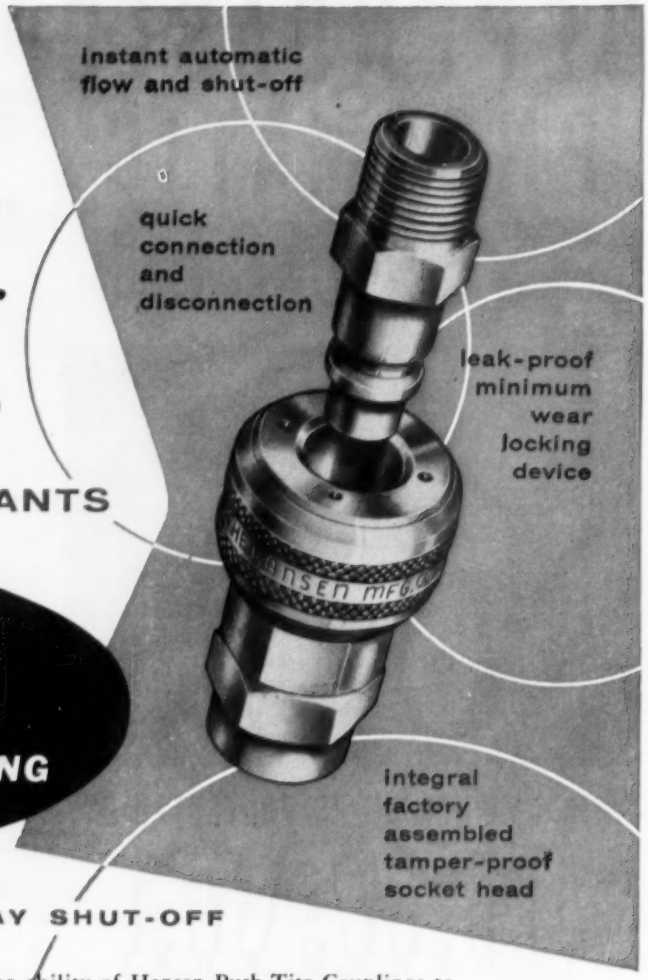
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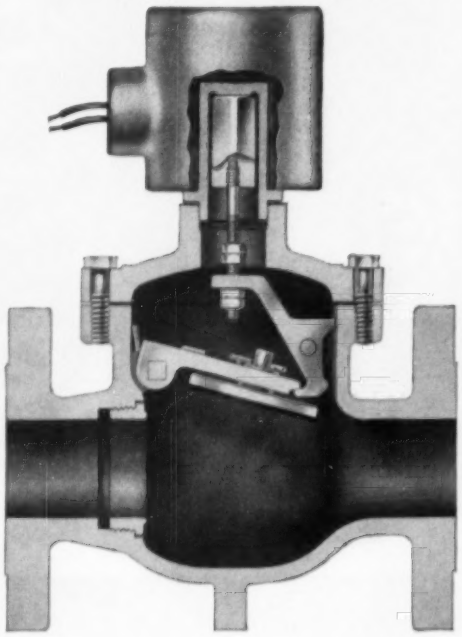
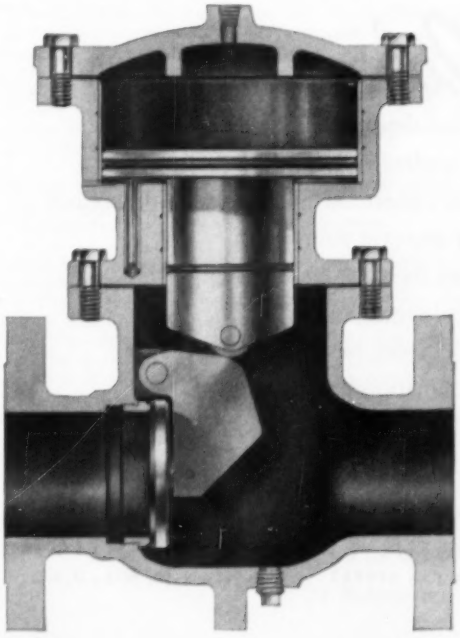
Latch type valve closes instantly



Piston type valve opens instantly



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The latch-type valves stop flow instantly, automatically. They may be actuated by excess flow, overpressure, underpressure, overtemperature; or by energizing or de-energizing a solenoid.

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The piston type valve opens instantly. Opening and closing of this valve may be from any remote location — either automatically or manually. It is ideal for deluge systems.

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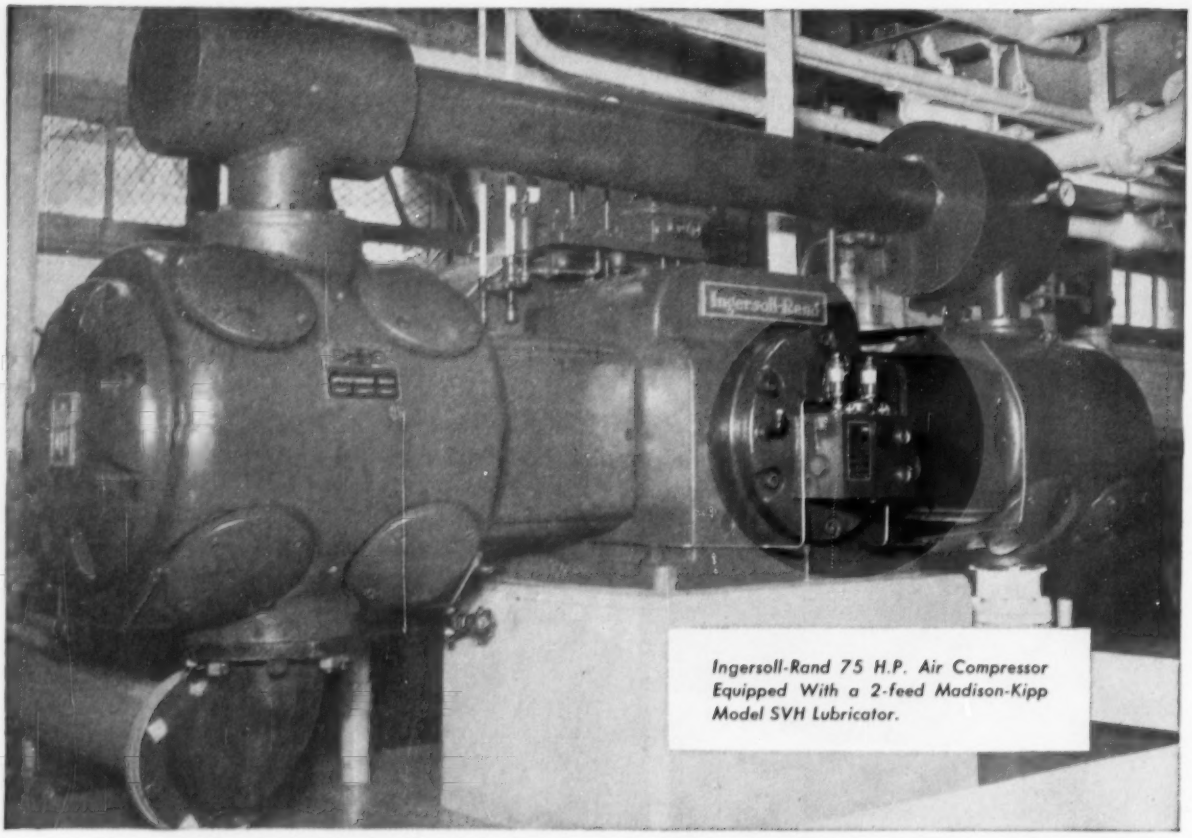

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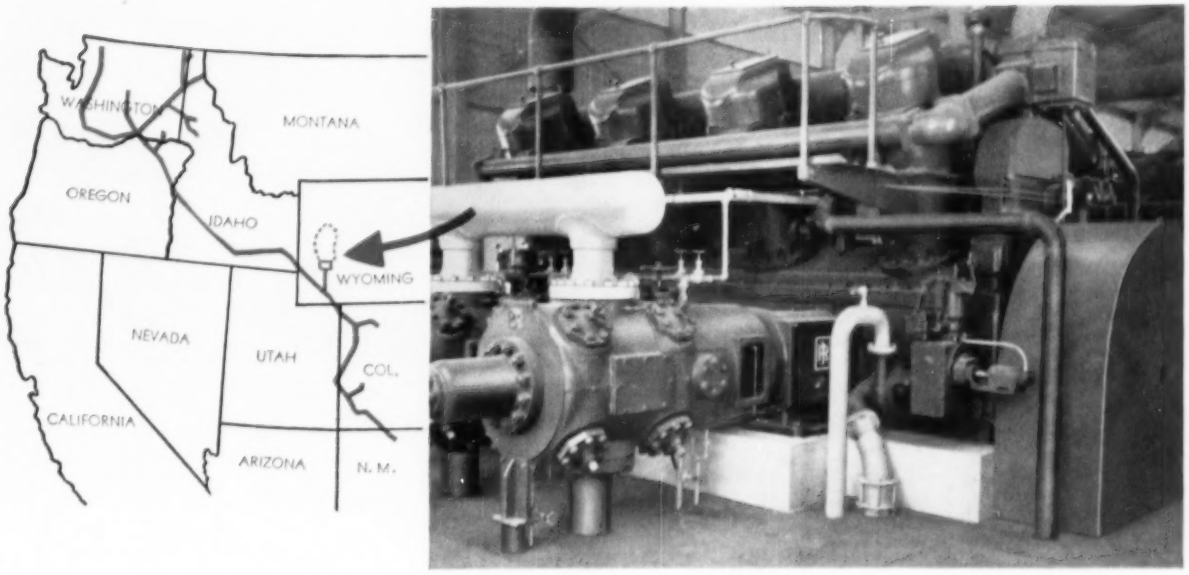
A NEW HIGH FOR I-R GAS-ENGINE COMPRESSORS



One of seven KVG Gas-Engine Compressors at Big Piney Station of Pacific Northwest Pipeline.

Seven KVG Units at 7,325 ft. altitude deliver gas from **BIG PINEY FIELD** to Pacific Northwest Pipeline

The Big Piney Station of the new Pacific Northwest Pipeline system is of special interest for two reasons.

Located at an elevation of 7,325 ft above sea level, it is the highest pipeline compressor station in the country—operating in temperatures ranging down to 40° below zero.

It has made possible the commercial utilization of Big Piney Field, which has been shut in for the past 18 years by lack of transportation facilities.

Hence it was quite appropriate that opening ceremonies for the Pacific Northwest Pipeline were held at Big Piney—where seven Ingersoll-Rand KVG Gas-Engine Compressors boost field gas to pipeline pressures. Two 880-hp units and two 660-hp units operate with intake pressures of 100-350 psi and discharge pressures of 400 to 550 psi. Three more 660-hp units have intake from 400 to 550 psi and discharge pressures of 650 to 850 psi.

Because of the extremely high altitude, the gas engines were supplied in bigger-than-normal sizes. Combined rated horsepower of the seven Big Piney units would be 5,060 hp at normal 1,000 ft altitude—for an actual load of about 3,885 hp under average conditions. The station is completely "winterized" for dependable operation at sub-zero temperatures.

Ingersoll-Rand Gas-engine Compressors now serving the various stations of the Pacific Northwest Pipeline include the following types and sizes:

SVG compressors, 330 hp
KVG compressors, 660 and 880 hp
Turbocharged KVS units, 1000 and 2000 hp
PKVG Gas Engine Power Units, 1100 hp

For maximum stability, flexibility and long-range economy under all pipeline conditions, it pays to specify Ingersoll-Rand four-cycle gas-engine compressors. Your I-R representative will gladly give you complete information on the units best suited to your needs.

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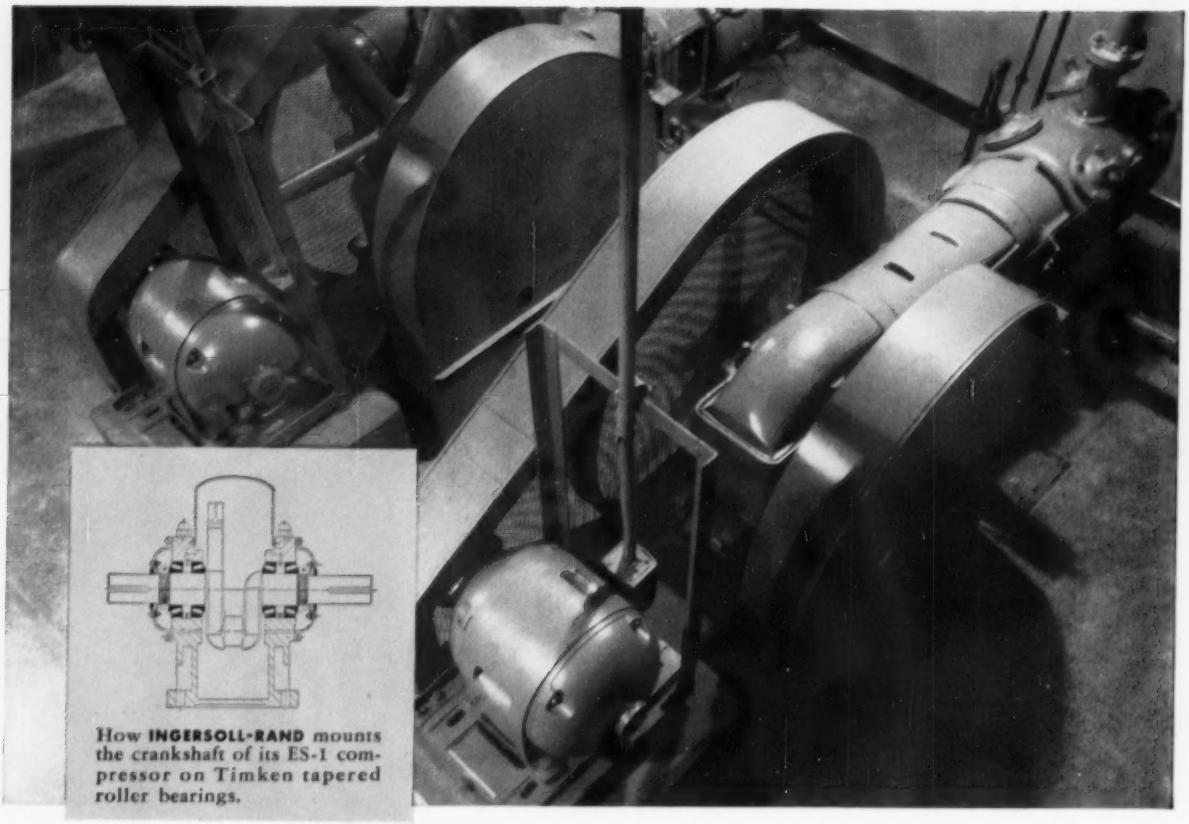

How **INGERSOLL-RAND** mounts the crankshaft of its ES-1 compressor on Timken tapered roller bearings.

Oil research lab keeps air flow up, maintenance down with compressor crankshafts on TIMKEN® bearings

TO assure a continuous flow of compressed air for instruments used in research at an oil company laboratory, Ingersoll-Rand mounts the crankshaft of this ES-1 compressor on Timken® tapered roller bearings.

With Timken bearings, friction is virtually eliminated. That's because Timken bearings are designed by geometrical law to have true rolling motion, and they're precision manufactured to live up to their design.

Timken bearings keep shafts and adjacent parts in positive alignment, keeping wear and downtime to a minimum. They hold shafts concentric with their housings, making closures more effective. Lubricant stays in—dirt and moisture stay out.

What's more, because of their tapered construction, Timken bearings take both radial and thrust loads in any combination. And full line contact between rollers and races gives them *extra* load-carrying capacity.

For rugged dependable performance with minimum wear, you can't beat Timken tapered roller bearings. We even make our own steel—an extra step we take to safeguard quality.

Next time you buy or build a compressor, insist on Timken bearings. They'll help you get the best possible service from your new machine. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

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